



U.S. Geol. Surv. Geodetic Survey INSTITUTE



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PROCEEDINGS

OF THE

LITERARY AND PHILOSOPHICAL SOCIETY

OF

LIVERPOOL,

DURING THE

FIFTY-SECOND SESSION, 1862-63. — 64

No. XVII. — 18



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SESSION LII., 1862-63.

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ORDINARY MEMBERS,

ON THE SOCIETY'S ROLL AT THE CLOSE OF THE 52ND SESSION.

Those marked + are Original Members of the Society.

Life Members are marked with an asterisk.

Jan. 26, 1863 Abbott, Joseph, B.A., *Collegiate Institution*, and 73, *Spencer-street*, *Everton*.

Oct. 11, 1833 Aikin, James, 2, *Drury-lane*, and 4, *Gambier-terrace*.

Dec. 10, 1860 Alexander, James, 8, *York buildings*, *Dale-street*, and 24, *Bedford-street South*.

Jan. 8, 1861 Anderson, David, 5, *Castle-street*, and 7, *Church-street*, *Egremont*.

Dec. 11, 1854 Andrew, John, *Fenwick chambers*, and *Sandown-park*, *Wavertree*.

*Nov. 28, 1853 Archer, Professor, F.R.S.E., F.R.S.S.A., Director of the *Industrial Museum of Scotland*, *Edinburgh*.

Feb. 22, 1855 Avison, Thomas, F.S.A., 18, *Cook-street*, and *Fulwood-park*, *Aigburth*.

Dec. 10, 1860 Baar, Rev. Hermann, Ph. D., 15, *Sandon-street*.
 May 1, 1854 Bahr, G.W., 4, *Cable st.* and 2, *South-hill Grove, Aigburth*.
 Dec. 15, 1862 Balman, Thomas, M.D., 6, *Bedford-street South*.
 Oct. 29, 1860 Banister, Rev. W., B.A., *St. James's Mount*.
 Jan. 13, 1862 Barnichson, Arnold, 35, *Dale street*, and *Blundell-sands, Great Crosby*.
 Nov. 3, 1862 Behrend, Saml. H., M.A., 24, *Clarendon-rooms*, and 15, *Canning-street*.
 Mar. 9, 1857 Bell, Christopher, *Moor-st.*, & 60, *Bridgest., Birkenhead*.
 Feb. 6, 1854 Bennett, William, *St. George's-place, Lime-street*, and 109, *Shaw-street*.
 Oct. 31, 1859 Birch, James, 13, *Rumford-place*, and 7, *Upper Baker-st.*
 April 15, 1861 Blake James, 63, *Kitchen-street*, and 45, *Canning-street*.
 Oct. 31, 1859 Bloxam, Frederick William, *Alliance Bank, Brown's-buildings*, and 157, *Islington*.
 Jan. 12, 1863 Bolton, Ogden, *Prince's-buildings, Harrington-street*, and 10, *Great George-square*.
 *Mar. 6, 1835 Boulton, Swinton, 1, *Dale-street*, and 3, *Bedford-street South*.
 Nov. 13, 1854 Bretherton Edward, F.G.S., 21, *Harrington-street*, and 47, *Hamilton-square, Birkenhead*.
 Oct. 21, 1844 Bright, Samuel, 1, *North John-street*, and *Sandheys, Mill-lane, West Derby*.
 *Jan. 8, 1855 Brockholes, James Fitzherbert, *Puddington Old Hall, near Neston*.
 Dec. 2, 1861 Browne, G. Mansfield, 15, *Fenwick street*, and 15, *South-hill-road, Toxteth-park*.
 April 21, 1862 Bulley, Samuel, *Peter's-place, Rumford-street*, and *East Lodge, Prince's-park*.
 May 3, 1857 Burton, Rev. Charles Henry, M.A., 1, *Sandon-terrace*.
 Mar. 9, 1863 Buxton, David, F.R.S.L., Principal of the School for the Deaf and Dumb, 52, *Oxford-street*.
 *May 1, 1848 Byerley, Isaac, F.L.S., F.R.C.S., *Victoria-road, Seacombe*.
 TREASURER.
 Feb. 23, 1863 Callon, W. J., M.D., 125, *Islington*.
 Nov. 3, 1862 Cameron, John, M.D., M.R.C.P., Physician to the Southern Hospital, and Lecturer on Medicine at Royal Inf. Sch. of Med., 17, *Rodney-street*.
 April 7, 1862 Campbell, John, *Liverpool and London-chambers, and Oak House, Aigburth-hall road*.

April 7, 1862 Cawkitt, James M., 28, *Chapel street*, and 23, *Queen's road*, *Everton*.

Dec. 2, 1861 Chadburn, William, 71, *Lord-street*.

Dec. 1, 1851 Clare, John Leigh, 11, *Exchange-buildings*, and 22, *Richmond-terrace*, *Everton*.

Oct. 31, 1859 Clark, Charles, 17, *North John-st.*, and *Linden Cottage*, *Rock Ferry*.

Jan. 26, 1857 Clay, William, 97, *Sefton-street*, and 4, *Parkhill-road*.

May 31, 1858 Collingwood, Cuthbert, M.A., M.B., Oxon, M.R.C.P., F.L.S., Lect. on Botany, Royal Infirmary Sch. of Med; Phys. to the Northern Hospital, 15, *Oxford-street*. HON. SECRETARY.

Jan. 26, 1863 Commins, Andrew, LL.D. Dub., *Clarendon-chambers*, 1, *South John-street*.

Jan. 22, 1850 Cox, Henry, 19, *Brunswick street*, and *Poplar-rd.*, *Oxton*.

Jan. 12, 1863 Cros, Jean Baptiste, 69, *Bold-street*, and 8, *Oxford-street*.

Oct. 6, 1862 Crosfield, William, Jun., 28, *Temple-street*, and 11a, *Rake-lane*.

Jan. 26, 1857 Dadabhai Naoroji, Professor of Gujarati, London University, 32, *Great St. Helen's, London, E.C.*

*April 6, 1840 Dickinson, Joseph, M.A., M.D. Dub., F.R.C.P., F.R.S., M.R.I.A., F.L.S., 92, *Bedford-street South*.

Nov. 27, 1848 Dove, Percy Matthew, F.S.S., 1, *North John-street*, and *Claughton*.

Jan. 23, 1848 Drysdale, John James, M.D., Edin., M.R.C.S., Edin. 44, *Rodney-street*.

Feb. 4, 1856 Duckworth, Henry, F.L.S., F.R.G.S., F.G.S., 5, *Cook-street*, and 2, *Gambier-terrace*.

*Nov. 27, 1848 Edwards, John Baker, Ph.D. Gies., F.C.S., Lect. on Chemistry, Liverpool Royal Infirmary Sch. of Med., *Royal Institution Laboratory*, and *Waterloo*.

Mar. 10, 1862 Ellison, Christopher O., 20, *Clayton-square*, and 29, *Falkner-street*.

April 7, 1862 English, Charles J., 26, *Chapel-street*, and 26, *Falkner-sq.*

Nov. 18, 1850 Evans, Henry Sudgen, F.C.S., 52, *Hanover-street*, and *Rainhill*.

Feb. 24, 1862 Ewer, Harry Alexander, 21, *Harrington-street*, and 57, *Canning-street*.

April, 30, 1860 Fabert, John Otto William, 1, *Parliament-street*, and 3, *St. James's Mount*.

*Dec. 14, 1846 Faram, John, 8, *Railway Cottages, Edge Hill*, and *Lime-street Railway Station*.

*Dec. 13, 1852 Ferguson, William, F.L.S., F.G.S., 2, *St. Aidan's-terrace, Birkenhead*.

Feb. 9, 1863 Finlay, William, Senior Mathematical Master, Middle School, *Collegiate Institution*, and 49, *Everton-road*.

*April 3, 1837 Fletcher, Edward, 4, *India-buildings*, and 31, *High Park-street*.

*Mar. 19, 1855 Foard, James Thomas, 12, *Salisbury-street, Strand, London*.

*Feb. 6, 1854 Gee, Robert, M.D. Heidelb. M.R.C.P., Lect. on Patholog. Anat. Royal Infirmary Sch. of Med.; Physician, Workhouse Hospital; 10, *Oxford-street*.

Feb. 9, 1863 Giles, Rev. Edward, *Huyton-park, Huyton*.

March 4, 1861 Ginsburg, Rev. Christian D., LL.D. Glasg., 10, *Rake-lane*.

Dec. 2, 1861 Graves, Samuel R., *Baltic-buildings*, and *The Grange, Wavertree*.

Jan. 26, 1863 Green, Rev. W. C., M.A., *Collegiate Institution*.

Nov. 14, 1853 Greenwood, Henry, 32, *Castle-st.*, and *Roseville, Huyton*.

Nov. 30, 1857 Grimmer, William Henry, 15, *Cable-st*, and 64, *Grove-st*.

Jan. 22, 1855 Hakes, James, M.R.C.S., Surgeon to the Northern Hospital, *Hope-street*.

Dec. 1, 1862 Hakes, Thomas, 20, *Castle-st.*, and 47, *Dean-st., Edge-lane*.

Feb. 23, 1863 Hall, Charlton R., 17, *Dale-street*, and *Liscard Castle, Liscard*.

*Jan. 21, 1856 Hardman, Lawrence, *York-buildings, Sweeting-street*, and *Rock-park, Rockferry*.

Feb. 9, 1863 Hart, Thos. Aubrey, M.A. Oxon, 81, *Bedford-st. South*.

Jan. 13, 1862 Harvey, Enoch, 12, *Castle-street*, and *Greenheys, Riversdale-road, Aigburth*.

April 27, 1862 Hausburg, Friedrich Leopold Ludwig, *Rosenfels, Woolton*.

*Mar. 7, 1842 Heath, Edward, *Orange-court, 37, Castle-street*, and *St. Domingo-grove, 114, Breckfield-road N., Everton*.

Dec. 12, 1855 Hess, Ralph, *Albany, Oldhall-street*, and 17, *Upper Duke-street*.

Dec. 28, 1846 Higgins, Rev. H. H., M.A., Cantab., F.C.P.S., *Rainhill*.
 VICE-PRESIDENT.

*Oct. 31, 1836 Higginson, Alfred, M.R.C.S., Surg. Southern Hosp.,
 44, *Upper Parliament-street*.

Nov. 3, 1862 Highat, Robt., 28, *Chapel-st.*, and *Page Moss Farm, Roby*.

Mar. 4, 1861 Hindley, Rev. H. J., M.A., 3, *Grecian-terrace, Everton*.

Jan. 12, 1857 Holden, E. Erasmus, *Appleton-in-Widnes, Warrington*.

Nov. 13, 1854 Holland, Charles, 17, *Tower-buildings North*, and
Liscard Vals, New Brighton.

Mar. 22, 1847 Horner, Henry P., 2, *Derby-square*, and 5, *Devonshire-road, Prince's-park*.

Nov. 4, 1850 Howson, Rev. John Saul, D.D. Trin. Col. Cantab., Principal of the Collegiate Institution, *Shaw-street*, and *Dingle-park, Dingle-lane*.

Dec. 27, 1841 Hume, Rev. Abrah., D.C.L. Dub., LL.D. Glas., F.S.A.,
 24, *Clarence-street, Everton*.

*Nov. 13, 1854 Hunter, John, Memb. Hist. Soc. Pennsylvania, *Halifax, Nova Scotia*.

Jan. 13, 1862 Hutchison, Robert, *Barned-buildings, Sweeting-street*, and 6, *Canning-street*.

Jan. 26, 1857 Hutton, David, 3, *St. George's Crescent*, and 61, *Canning-street*.

*Apr. 29, 1850 Ihne, William, Ph.D. Bonn, President of the Philomathic Society, 316, *Upper Parliament-street*. PRESIDENT.

Feb. 23, 1857 Imlach, Henry, M.D. Edin., 1, *Abercromby-square*.

*Oct. 21, 1844 Inman, Thomas, M.D. London, M.R.C.P., Phys. Royal Infirmary, 12, *Rodney-street*, and *Spital, Cheshire*.

Mar. 10, 1862 Johnson, Richard, *Queen Insurance-buildings*, and *Brookfield House, Seaforth*.

Jan. 26, 1863 Johnson, Richard, jun., *Queen Insurance-buildings*.

Jan. 23, 1854 Jones, John, 28, *Chapel-street*, and 70, *Rodney-street*.

Mar. 9, 1863 Jones, Rev. Joshua, M.A. Oxon, Principal of the Liverpool Institute, 59, *Bedford-street South*.

*April 4, 1852 Jones, Morris Charles, *Queen Insurance-buildings*, and 75, *Shaw-street*.

Mar. 23, 1863 Jones, R. D., B.A., T.C.D., *Collegiate Institution*.

May 5, 1851 Jones, Roger Lyon, *Liverpool and London Chambers, Exchange*, and 6, *Sunnyside, Prince's-park*.

Nov. 26, 1860 Kenworthy, James, M.D., *Parkgate, Cheshire.*
 Feb. 19, 1855 King, Alfred, 14, *Newington, and 9, Netherfield-rd. South.*
 Jan. 10, 1848 Lamport, William James, 21, *Water-street, and 5, Beech-terrace, Beech-street, Fairfield.*
 *Jan. 14, 1839 Lassell, William, F.R.S.S.L. and E., F.R.A.S. 27, *Milton-street, and Broadstones, Sandfield-park, West Derby.*
 April 27, 1862 Lassell, William, Jun., 27, *Milton-street, and Tue Brook.*
 Oct. 21, 1844 Lear, John, 1, *North John-st., and 22, Holland-terrace, Duke-street, Edge-hill.*
 Feb. 10, 1862 Leycester, Edmund Mortimore, Commander R.N., *Admiralty Office, 2, Drury-lane, and 20, Belvedere-road, Prince's-park.*
 Dec. 10, 1860 Leyland, Joseph, *Williamson-square.*
 Feb. 9, 1863 Lister, Edward, L.R.C.P.E., 1, *Deane-street, Fairfield.*
 May 4, 1863 Lister, James, *Union Bank, 6, Brunswick-street, and Greenbank, 166, Breckfield-road North.*
 Feb. 9, 1863 Loraine, Rev. Nevison, M.A., 1, *The Willows, Breck-road.*
 Oct. 20, 1859 M'Andrew, James Johnston, 5, *North John-street, and Greenfield Cottage, Bromborough.*
 *Oct. 21, 1844 M'Andrew, Robert, F.R.S., F.I.S., *Isleworth House, Isleworth, London.*
 March 9, 1857 MacFie, Robert Andrew, 30, *Moorfields, and Ashfield Hall, Neston, Cheshire.*
 April 20, 1863 Marples, David, 50B, *Lord-street, and 168, Chatham-st.*
 April 4, 1853 Marrat, Frederick Price, 22, *Arcade, and 2, Peverille-terrace, Edge-lane.*
 Jan. 21, 1839 Martin, Studley, *Exchange-chambers, & 109, Bedford-st.*
 Feb. 5, 1844 Mayer, Joseph, F.S.A., F.R.A.S., F.E.S., 68, *Lord-street.*
 Jan. 12, 1863 Mellor, Rev. Enoch, M.A., 15, *Devonshire-road, Prince's-park.*
 April 1, 1861 Melly, George, 7, *Water-street, and 90, Chatham-street.*
 Oct. 31, 1859 Moore, Thomas John, Corr. Mem. Z.S., Curator Free Public Museum, *William Brown-street.*
 Jan. 8, 1855 Morton, George Highfield, F.G.S., 9, *London-road.*
 April 16, 1849 Moss, Rev. John James, B.A., *Upton, Cheshire.*
 Oct. 29, 1850 Mott, Albert Julius, 19, *South Castle-st., and Holt-hill.*
 April 3, 1854 Mott, Charles Grey, 27, *Argyle-street, Birkenhead, and 2, Shewell's-road, Holt-hill.*

Oct. 20, 1856 Nevins, John Birkbeck, M.D., Lond., M.R.C.S., Lect. on *Materia Medica*, Roy. Infirmary School of Medicine, 25, *Oxford-street*. VICE-PRESIDENT.

April 7, 1862 Newlands, Alexander, 6, *Rumford place*, and 13, *Canning-street*.

Nov. 3, 1862 Newlands, Capt. Alex., *Elm Tree Farm, Fairfield*.

Dec. 15, 1851 Newlands, James, F.R.S.S.A., Borough Engineer, 2, *Cornwallis-st.*, and 4, *Clare-terrace, Duke-st. North, Edge-hill*.

*Nov. 29, 1847 Nisbet, William, L.F.P.S.G., *Church-street, Egremont*.

*Oct. 15, 1855 North, Alfred, *Salcombe Hill, Sidmouth, Devonshire*.

Nov. 18, 1861 Nugent, Rev. James, *Crosby*.

Oct. 6, 1862 Owen, Rev. Loftus, 46, *Eastbourne-street*.

Mar. 23, 1863 Page, Rev. George C., LL.D., *Gambier House, Fairfield*.

Nov. 4, 1861 Philip, Thomas, D., 49, *South Castle street*, and 47, *Prospect-vale, Fairfield*.

Dec. 28, 1846 Pierton, James Allanson, F.S.A., Chairman of the Library and Museum Committee, 11, *Dale-street*, and *Sandy-knowe, Wavertree*.

Feb. 6, 1854 Prange, F., *Royal Bank-buildings, Dale-street*, and 2, *Grove-park, Lodge-lane*.

April, 7, 1862 Rankin, Robert, Chairman of the Dock Board, 55, *South John-street*, and *Brombro' Hall, Cheshire*.

†Mar. 13, 1812 Rathbone, William, 20, *Water-street*, and *Greenbank, Wavertree*.

Nov. 12, 1860 Rathbone, Philip H., 4, *Water-street*, and *Greenbank-cottage, Wavertree*.

Mar. 24, 1862 Rathbone, Richard Reynolds, 21, *Water-street*, and *Laurel Bank, St. Michael's-road*.

*Jan. 7, 1856 Rawlins, Charles Edward, Jun., 23, *Cable-street*, and 1, *Windermere-terrace, Prince's-park*.

*Nov. 17, 1851 Redish, Joseph Carter, Vice-President of the Philomathic Society, 18, *Chapel-st.*, and *Church-rl., Wavertree*.

Mar. 20, 1854 Rigge, Thomas, 64, *Rodney-street*.

Nov. 2, 1840 Robberds, Rev. John, B.A., 58, *High Park-street*. VICE-PRESIDENT.

Feb. 10, 1862 Rogers, Thomas Law, M.D., M.R.C.P., Superintendent, *County Asylum, Rainhill*.

Feb. 9, 1863 Ronald, Lionel K., 19, *Dale-st., & Elm House, Edge-lane.*
 April 18, 1854 Rowe, James, 2, *Chapel-walks*, and 51, *Shaw-street.*
 Mar. 23, 1863 Roxburgh, Archibald, 11, *Rumford-place*, and 98, *Bedford-street South.*

April 7, 1862 Samuel, Harry S., 1, *Victoria-buildings, Hackin's hey*,
 and 2, *Canning-street.*
 April 6, 1846 Scholfield, Henry Daniel, M.D., Oxon, M.R.C.S., 14,
Hamilton-square, Birkenhead.
 *April 21, 1862 Smith, James, *Barkeley House, Seaforth.*
 †Mar. 13, 1812 Smith, James Houlbrooke, 28, *Rodney-street*, and
Green-hill, Allerton.
 Feb. 23, 1863 Smith, J. Simm, *Royal Insurance Office, Dale-street.*
 Feb. 24, 1862 Snape, Joseph, Lecturer on Dental Surgery, Royal
 Infirmary School of Medicine, 75, *Rodney-street.*
 Nov. 12, 1860 Spence, Charles, 4, *Oldhall-street*, and 21, *Catherine-street.*
 Feb. 10, 1862 Spence, James, 30, *North John-street*, and 54, *Upper
 Parliament-street.*
 Dec. 14, 1857 Steele, Robert Topham, 4, *Water-street*, and 8, *Bedford-
 street South.*
 Dec. 2, 1861 Steinthal, Rev. Samuel Alfred, 59, *Rodney-street.*
 Oct. 18, 1858 Stuart, Richard, 10, *Exchange-street East*, and *Brooklyn
 Villa, Breeze-hill, Walton.*
 *Feb. 19, 1855 Taylor, John Stopford, M.D. Aberd., F.R.G.S., 1, *Spring-
 field, St. Anne-street.*
 Jan. 23, 1843 Taylor, Robert Hibbert, M.D. Edin., L.R.C.S., Ed.,
 Lect. on Ophthalmic Medicine, Royal Infirmary
 School of Medicine, 1, *Percy-street.*
 Dec. 11, 1854 Thompson, Samuel H., *Thingwall Hall, Knotty Ash.*
 Nov. 17, 1856 Tinling, Chas., 60, *Castle-st.*, and *Bedford-terrace*, 48,
Low-hill.
 Nov. 26, 1860 Tooke, William H., *Church-street*, and *Wellington-street*,
Waterloo.
 Dec. 1, 1851 Towson, John Thomas, F.R.G.S., Scientific Examiner,
 Sailor's Home, 47, *Upper Parliament-street.*
 *Feb. 19, 1844 Turnbull, James Muter, M.D. Edin., M.R.C.P., Phys.
 Royal Infirmary, 86, *Rodney-street.*
 Oct. 21, 1861 Unwin, William Andrew, 11, *Rumford-place*, and
Newbie-terrace.

Oct. 21, 1844 Vose, James Richard White, M.D. Edin., F.R.C.P.,
Phys. Royal Infirmary, 5, *Gambier-terrace*.

Mar. 18, 1861 Walker, Thomas Shadford, M.R.C.S., 54, *Rodney-street*.

Jan. 27, 1862 Walmsley, Gilbert G., 50, *Lord-street*.

Feb. 10, 1862 Weightman, John Hardham, 57, *Ranelagh-street*, and
27, *Baker-street, Low-hill*.

Dec. 2, 1861 Weightman, William Henry, *Leith Offices, Moorfields*,
and *Hapsford-lane, Litherland*.

Jan. 26, 1863 Whitelaw, George, *Collegiate Institution*.

April 7, 1862 Whittle, Ewing, M.D., Lecturer on Med. Jurisprudence
Royal Inf. Sch. of Med., 65, *Catherine-street*.

Oct. 29, 1855 Wilks, William George, 1, *Dale-st.*, and *Mill-bank, Anfield*.

April 7, 1862 Willans, Thomas H., 82, *Rodney-street*.

Nov. 18, 1861 Williams, Charles Wye, A.I.C.E., *The Nook, St.*
James's Mount.

Mar. 18, 1861 Wood, Geo. S., *Belle-vue-road, Wavertree*, and 20, *Lord-st.*

Feb. 9, 1863 Wood, John W., 81, *Church-street*.

HONORARY MEMBERS.

LIMITED TO FIFTY.

1812 Peter Mark Roget, M.D. Edin., F.R.C.P., F.R.S., F.G.S., F.R.A.S.,
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1819 John Stanley, M.D. Edin., *Whitehaven*.

1827 Rev. William Hincks, F.R.S.E., F.L.S., Professor of Natural
History in University College, *Toronto, C.W.*

1828 Rev. Brook Aspland, *Dukinfield, Cheshire*.

1833 The Right Hon. Dudley Ryder, Earl of Harrowby, K.G., D.C.L.,
F.R.S., *Sandon-hall, Staffordshire*, & 39, *Grosvenor-*
square, London, W.

1833 James Yates, M.A., F.R.S., F.L.S., F.G.S., &c., *Lauderdale House*,
Highgate, London.

†1835 John Ashton Yates, F.R.G.S., *Bryanton-square, London*.

1835 George Patten, A.R.A., 21, *Queen's-road West, Regent's-park, London*.

1835 William Ewart, M.P., *Cambridge-square, Hyde-park, London*.

1835 The Right Hon. Lord Brougham and Vaux, M.A., D.C.L., F.R.S.,
Chancellor of the University of Edinburgh, 4,
Grafton-street, London, W., and *Brougham Hall, Peurith*.

1837 The Most Noble William, Duke of Devonshire, K.G., M.A., F.R.S.
 F.G.S., &c., Chancellor of the Univer. of Cambridge,
Devonshire House, London, W., and *Chatsworth,
 Derbyshire.*

1838 Geo. Biddell Airy, M.A., D.C.L., F.R.S., Hon. F.R.S.E., Hon.
 M.R.I.A., V.P.R.A.S., F.C.P.S., &c., Astronomer
 Royal, *Royal Observatory, Greenwich.*

1840 James Nasmyth, F.R.A.S., *Penshurst, Kent.*

1840 Richard Duncan Mackintosh, L.R.C.P., *Exeter.*

1841 Charles Bryce, M.D., *Glasg.*, Fell.F.P.S.G., *Brighton.*

1844 J. Beete Jukes, M.A., F.R.S., M.R.I.A., F.G.S., Local Director of
 the Geological Survey of Ireland, 51, *Stephen's-green,
 Dublin.*

1844 T. P. Hall, *Coggeshall, Essex.*

1844 Peter Rylands, *Warrington.*

1844 John Scouler, M.D., LL.D., F.L.S., *Glasgow.*

1844 Thomas Rymer Jones, F.R.S., F.Z.S., F.L.S., Professor of Comparative Anatomy, *King's College, London.*

1844 Robert Patterson, F.R.S., M.R.I.A., *Belfast.*

1844 —— Alger, *Boston, U.S.*

1844 Sir Charles Lemon, Bart., M.A., Cantab., F.R.S., F.G.S., *Penrhyn,
 Cornwall.*

1844 William Carpenter, M.D., Edin., F.R.S., F.L.S., F.G.S., *Registrar
 London University.*

1847 Sir William Rowan Hamilton, LL.D., Hon. F.R.S.E., M.R.I.A.,
 F.R.A.S., F.C.P.S., Astronomer Royal for Ireland,
Dublin.

1848 Rev. Thomas Corser, M.A., *Strand, Bury.*

1850 Rev. St. Vincent Beechey, M.A., Cantab., *Worsley, near Eccles.*

1851 James Smith, F.R.S.S.L., and E., F.G.S., F.R.G.S., *Jordan-hill,
 Glasgow.*

1851 Henry Clarke Pidgeon, *London.*

1851 Rev. Robert Bickersteth Mayor, M.A., Fell. St. John's Coll. Cantab.,
 F.C.P.S., *Rugby.*

1852 William Reynolds, M.D., *Coed-du, Denbighshire.*

1853 Rev. James Booth, LL.D., F.R.S., &c, *Stone, near Aylesbury.*

1857 Thomas Jos. Hutchinson, F.R.G.S., F.R.S.L., F.E.S., H.B.M.
 Consul, *Fernando Po.*

1860 Sir William Brown, Bart., *Richmond-hill, Liverpool.*

1861 Louis Agassiz, Professor of Natural History in Harvard University,
Cambridge, Massachusetts.

1861 William Fairbairn, LL.D., C.E., F.R.S., *Polygon, near Manchester.*
 1861 Rev. Thomas P. Kirkman, M.A., F.R.S., *Croft Rectory, Warrington.*
 1862 The Right Rev. H. N. Staley, D.D., Bishop of Honolulu,
Sandwich Islands.
 1863. Edward J. Reed, Chief Constructor of H.M. Navy, *Admiralty, and*
Hyde Vale, Greenwich, S.E.

ASSOCIATES.

LIMITED TO TWENTY-FIVE.

Dec. 2, 1861 Captain James Anderson, R.M.S.S. "China," Cunard
 Service, 34, *Richmond-terrace, Everton.* (Atlantic.)
 Jan. 27, 1862 Captain John H. Mortimer, ship "America." (Atlantic.)
 Mar. 24, 1862 Captain P. C. Petrie, "City of London," Commodore
 of the Inman Line of American Steam Packets.
 (Atlantic.)
 Feb. 9, 1863 Captain James P. Anderson, First Officer R.M.S.S.
 "China," Cunard service, *Commercial Hotel, Dale-st.*
 (Atlantic.)
 Feb. 9, 1863 Captain John Carr (Bushby and Edwards), ship
 "Scindia," 43, *Hope-street.* (Calcutta.)
 Feb. 9, 1863 Captain Charles E. Pryce, R.N.R. (L. Young and Co.),
 ship "Cornwallis" (Calcutta and Sydney).
 April 20, 1863 Captain Fred. E. Baker, ship "Niphon." (Chinese seas.)

TR EASURER'S ACCOUNTS, 1861-62.

Dr. *Literary and Philosophical Society, in Account with Isaac BYERLEY, Treasurer, to October, 1862.*

	Cr.
To paid Brakell for Printing "Proceedings"	£ s. d.
" Tinling for Printing and Stationery	68 3 4
" Secretary's General Expenses of Management	14 1 4
" Miscellaneous Accounts	17 13 0
" Editorial Fee	1 5 0
" Special Vote to Secretary for extra duties	10 10 0
" Mrs. Johnson, Tea, Coffee, &c.	10 10 0
" Balance due to Treasurer	12 3 8
" Collector's Commission	4 0 8
" Waiter's Attendance	5 7 0
" Share of Expense for Stationery, &c, for "Galary of Inventions" Committee.....	2 7 6
" Balance due to Collector	2 19 0
	151 0 6
Balance carried down.....	199 11 10
	£350 12 4
	<i>Errors excepted.</i>
October, 1862,	
Audited and found correct,	
J. C. REDISH,	
CHRISTIAN D. GINSBURG.	
By Balance from last account:—	£ s. d.
Dock Bond	£100 0 0
In Bank	55 3 10
" " proceeds of Festival	50 0 0
	206 3 10
Subscriptions (Annual)	115 10 0
" " (Arrears)	11 0 6
Entrance Fees	18 18 0
	£350 12 4
Balance brought down—	
Dock Bond	£100 0 0
In hands of Treasurer	99 11 10
Exclusive of Arrears.....	199 11 10

PROCEEDINGS
OF THE
LIVERPOOL
LITERARY AND PHILOSOPHICAL SOCIETY.

ANNUAL MEETING—FIFTY-SECOND SESSION.

ROYAL INSTITUTION, October 6th, 1862.

The REV. H. H. HIGGINS, M.A., the retiring President,
in the Chair.

The minutes of the last meeting having been read and signed,
The SECRETARY read the following

R E P O R T.

The Literary and Philosophical Society commences this, its fifty-second Session, under conditions more favorable, and with prospects more encouraging, than have, perhaps, ushered in any previous Session since its foundation fifty years ago. Having fully completed the *first* half-century of its existence, it has, instead of declining, only thereby reached that mature age, and self-sustaining position which enables it to enter upon a *second* with every anticipation of an increasing career of usefulness, and a more extended sphere of action. Long as the Society has been in existence, it remained for the spring of the present year to bring it into such prominent notice as it had never before obtained, and to gain for it an

amount of publicity it had never before received. The completion of its fiftieth year, which took place in March last, was naturally embraced by your Council as an event worthy of celebration, and the success of the Jubilee Festival is now a matter known to every one. An account of the proceedings of that festival forms part of the volume for the past year; and it may be said that the success of that celebration has given the Society an impulse which will long be beneficially felt. It is for the members of the Society to avail themselves of the passing opportunity of enlarging its bounds and increasing its influence.

One of the most healthful signs exhibited by the Society is the small number of resignations which have taken place, and the large number of accessions it has received to its ranks during the past year. We count but seven names retiring from the list, five of whom have left Liverpool, two only having resigned from other causes. Death, which was so busy during the previous Session, has, during the past year, deprived us of none of our ordinary members. Against this small number of losses we have to place thirty-nine newly-elected members, among them, gentlemen who may, and no doubt will, be of considerable service to the Society. The number of ordinary members at the close of the last Session was 166.

As a natural consequence, the funds of the Society are in a flourishing condition. Instead of withdrawing £50 from the reserve fund as it was thought it might be necessary to do, that sum has been *added to* the £150 previously in the hands of the Treasurer, while the newly-elected members have contributed a further sum of £50 to the working expenses, upwards of £30 of which (£33 13s.) are added to the permanent income of the Society. The Treasurer's accounts, which will be laid before you this evening, will show, that although the Society's expenses have been unusually great during the last

two or three years, its present financial condition is a matter, not of doubt and fear, but of congratulation.

Our list of honorary members has been increased by the addition of the names of four gentlemen, some of whom have already proved themselves *working* members of the Society. As there are but thirty-eight names on this list, which might contain fifty, it is a matter of consideration whether the Society should not judiciously fill up the vacancies during the present Session. In this class of members, however, we have lately sustained a loss which cannot be otherwise than keenly felt by the Society. Dr. Thomas Stewart Traill, the founder and first Secretary—the able and energetic pilot of the Society in its earliest days—the untiring caterer of literary and scientific material during its period of infancy and youth—expired, full of years, at his residence, Rutland-square, Edinburgh, on the 30th July last, aged 80. It is impossible for those of the present generation adequately to appreciate the influence which Dr. Traill exercised upon the early years of the Society, but the few of his contemporaries who are still spared know that he was the *mainspring* of the Society—its unwearied promoter and active supporter—its very life and soul. A reference to the early records of the Society proves the vast number of communications which he laid before the members, upon the most varied subjects of literature and science, exhibiting that extraordinary versatility of talent which distinguished him to his latest years. He was born at Kirkwall (where his father was parish minister) in 1781, and in 1803, he settled in Liverpool as a general practitioner.

In the palmy days of the Augustan period of literature in Liverpool, Dr. Traill played a leading part. Not only was he associated with the foundation of our Society, but also with that of the Royal Institution in which we meet, so that his memory has a double claim upon our reverence and respect. He was, moreover, one of the founders of the Liverpool

Mechanics' Institution, and delivered the first course of lectures connected therewith, on chemistry, in 1825. In 1832, he was appointed Professor of Medical Jurisprudence in the University of Edinburgh, and he henceforth quitted Liverpool, having first filled the office of President of our Society. Since that period his name has been upon our list of corresponding members. He retained his Edinburgh professorship up to the time of his death, and his latter years have given ample proof that his mental powers survived in their full activity. The gigantic labour of editing the last edition of the *Encyclopaedia Britannica* was undertaken by him, and achieved in spite of his increasing years. That great work was safely carried by him through the press, and is a fitting monument of the vast information, unwearied research, activity of mind, and persevering industry which he brought to bear upon everything which he undertook.

The laws of the Society not having been printed since the edition of 1848, although various changes have been made from time to time, it was deemed advisable to issue a new edition. To that end, your Council carefully revised them, and suggested amendments and improvements in accordance with the present condition of the Society; and having submitted them to general meetings of the members, they were approved and passed, and were incorporated in the corrected edition now in the hands of the members.

The most important change in the constitution of the Society made during the past Session was the introduction of a new class of members, termed *Associates*. The Literary and Philosophical Society will probably never regret having initiated a plan which is likely to be productive of so much benefit to the causes of science and philanthropy. The number of Associate members is limited to twenty-five, but only three were elected last year, because the Society was of opinion that the distinction should be cautiously given, and that time

should be allowed to make it more generally known among the class which it was intended to embrace. A further step in the same direction which your Society carried out was the drawing up of suggestions, addressed to the officers of merchant vessels, how best to employ the opportunities they possess for advancing zoological information, by observation and collection in foreign countries. These directions will be found printed in an *Appendix* at the end of the volume; and the Council further voted a sum of money for the printing and circulation of these directions among those to whom they are addressed.

It is not expected that any sudden accessions of knowledge or of specimens will accrue from this movement, but the information thus widely disseminated, and the impulse thus given to scientific study among our merchant seamen, cannot fail to work gradually, but nevertheless surely, and beneficial results will doubtless exhibit themselves ere long.

The volume of Proceedings for the past year has been somewhat delayed, but will shortly be in the hands of the members. The papers it contains sustain the character of the society, and are both of a literary and scientific nature. One of them has been considered of sufficient importance to have been adopted by the Government, and the Committee of Council on Education has requested the author to supply copies for the use of the Navigation Schools under the Department of Science and Art.

Measures continue to be taken for placing your library on a proper footing and in an efficient condition. Your Secretary has secured promises of correspondence from numerous societies, and the exchanges take place with greater regularity than heretofore. The Committee of the Royal Institution have taken steps to provide more accommodation for books than was previously obtainable, and the Society's volumes will shortly be placed in a condition for binding and cataloguing, in order to be of further service to the members.

Proposals will be brought before you to increase the popularity of the Society's meetings by admitting *ladies* at certain stated periods, and it is believed that by this means the Society may become more widely known and appreciated, without in any degree derogating from its dignity or scientific value. It is well known that the admission of ladies is an essential element of the popularity of some societies, such as the Royal Geographical Society and the British Association, and it is believed that on certain occasions, when papers of more general interest are to be read, the throwing open of the meeting to ladies may be attended with beneficial results.

The delegates from the Society to assist in the management of the Gallery of Inventions and Science regret that they cannot make a very satisfactory report. The building is ready to receive models, &c., but the Library and Museum Committee have expressed their inability to supply the funds for the expenses of keeping up the exhibition. Under these circumstances it becomes a matter of debate whether the functions of the delegates should cease, or whether they should be re-elected for another year, in the hope that some means may be suggested by which the plans of the united committees may be carried out. The closing of the International Exhibition presents opportunities for obtaining objects of interest for the gallery which seem to render it desirable that the Committee of Management should not cease to exist at this juncture.

The Literary and Philosophical Society may well be proud of its position. Established upon a firm basis of public support—more widely known through the medium of its recent successful Jubilee Festival—it occupies a place in the town of Liverpool which no other society *can* occupy. The prestige of its age, as the *senior* scientific society—the reverence due to its founders, as the literary and scientific ornaments of Liverpool—the interest of its history, associated

for so long a period with the *personal* history of her most distinguished citizens,—these are causes sufficient to make us regard it with just pride, and to stir ourselves into activity for the promotion of those objects which this society is so well calculated to attain. Add to this an increasing number of members, and a consequent increase of funds, and it will at once be perceived that we have at the same time the advantages of mature age and renovated youth—of reverence for the past, and of renewed hope for the future. On the *members*, therefore, it depends to render the Society by their exertions, worthy of themselves, and of the town, to keep up the character of its Proceedings, to come forward with original papers, and to exhibit to the literary and scientific world, a volume which shall compete, in the value of its contributions, with that of any other provincial learned society.

You will be called upon this evening to select a gentleman from your body to act as your President for the next three years. In accordance with Law 36, also, it will be necessary to ballot for five gentlemen who were not upon the Council of last year, to take part in the deliberations of the succeeding one; and the retiring Council recommend for that purpose the following names:—Mr. A. Higginson, Mr. H. S. Evans, Mr. J. A. Picton, Mr. P. H. Rathbone, Mr. A. Baruchson.

(Signed,)

H. H. HIGGINS, M.A., President.

CUTHBERT COLLINGWOOD, M.A., Hon. Sec.

The Treasurer, Mr. BYERLEY, then laid his annual statement of accounts before the Society, which was received and passed. It showed a balance of about £200 to the credit of the Society.

The Rev. H. H. HIGGINS, M.A., on vacating the chair of the Society, then read the following

VALEDICTORY ADDRESS.

Gentlemen of the Literary and Philosophical Society.

The three years which have passed since you did me the honour to elect me as your President have seen great and most important movements in literature, in natural science, in the town of Liverpool, and in our own Society.

Literature has received an impulse by the establishment of a system of competitive examinations throughout the country; and now, for the first time, the chief of the honours and emoluments at the disposal of the nation are brought to bear upon the advancement of the standard of liberal education.

Many honourable trophies have been won in the fields of natural science; the astronomer has been supplied with a new "arm of precision," in the analysis of the spectrum; man has been further from the earth than ever he has been before, to return again; and great progress has been made in tracing the relations between the imponderable agents, light, heat, electricity, and force.

But it is in zoology and botany that, as I believe, the greatest progress has been made, affecting not so much the physiologists, who have, for a much longer period thoroughly appreciated their own department of labour, as the more ordinary class of naturalists, who, by Mr. Darwin's work on the "Origin of species," have been taught, and have already extensively learned, the true meaning of natural history,—that it is the science not merely of the distinctions between living forms, but of comparative life. Much as I disagree with the conclusions of Mr. Darwin, I regard the publication of his book as an epoch in natural history.

It is quite unnecessary for me to dwell upon the importance to the town of Liverpool of such events as the opening of the Free Public Library and Museum, the establishment of the School of Science, and the formation of the Naturalists' Field Club.

With so many fresh demands upon the support of the friends of science in Liverpool, it could hardly have been held a wonder if our own Society had received somewhat less of public attention than formerly, but the case has happily been quite the reverse. The circumstances of our prosperity are before you in the Report drawn up by one who, more than any other individual, has contributed to the measure of our recent success.

It only remains for me to resign into your hands the trust committed to me. The distinction of having been your President will, through life, be to me a source of grateful recollection. For this honour I sincerely thank you, and in resuming my place amongst you I anticipate in my future attendance at your meetings a continuance of the profit and pleasure which, for a period of fourteen years, I have from time to time so largely received.

It was then moved by the Rev. J. ROBBERDS, B.A., seconded by Mr. BARUCHSON, and resolved unanimously—“That the retiring President be requested to allow his Address to be printed in the Proceedings of the Society.”

The Rev. Mr. Higgins gave his assent to this proposal.

The following officers were then elected in the usual manner:—

President (for three years) :

WILLIAM IHNE, Ph.D.

Vice-Presidents :

Rev. H. H. HIGGINS, M.A.

J. BIRKBECK NEVINS, M.D.

REV. J. ROBBERDS, B.A.

Treasurer :

ISAAC BYERLEY, F.R.C.S., F.L.S.

Hon. Secretary :

CUTHBERT COLLINGWOOD, M.A. and M.B. (Oxon), F.L.S., &c.

The following gentlemen were also elected members of the Council :—

Joseph Carter Redish, Charles Clark, Thos. John Moore, Corr. Mem. Z. S., Rev. Christian D. Ginsburg, Alfred Higginson, M.R.C.S., Henry S. Evans, F.C.S., J. A. Picton, F.S.A., Philip H. Rathbone, and Arnold Baruchson.

The following gentlemen were re-elected as delegates to the Gallery of Inventions and Science :—Rev. H. H. Higgins, Dr. Nevins, Dr. Collingwood, Mr. A. Higginson, and Mr. H. Duckworth.

Captains Anderson, Mortimer, and Petrie, were continued in the list of Associate members of the Society.

The Society then took into consideration the following recommendation of the Council :—“ That ladies be invited to attend such meetings of the Society as the Council shall from time to time select,” which was moved by Dr. Ihne, and seconded by the Rev. H. H. Higgins ; whereupon an amendment was moved by Mr. Unwin, seconded by Mr. H. Duckworth—“ That ladies be admitted to all the meetings of the Society.” On a division being taken, the original motion was carried by a large majority.

The Rev. Loftus Owen, and Mr. William Crosfield, jun., were then elected ordinary members of the Society.

Numerous donations to the Library were then laid upon the table, a list of which will be found in an Appendix.

FIRST ORDINARY MEETING.

ROYAL INSTITUTION, October 20th, 1862.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

The following communication was received from the Committee of the Royal Institution, respecting the death of Dr. Traill, one of its founders :—

“ That, having long regarded Dr. Thomas Stewart Traill with affectionate veneration, as one of the founders of the Liverpool Royal Institution, whose lectures shed a lustre on its early history, who was most intimately associated with whatever distinguished Liverpool, in the days when Liverpool first obtained a name in literature and science, and knowing that, notwithstanding the severance of his immediate connection with this town by his appointment to the chair of Medical Jurisprudence in the University of Edinburgh, he retained to his last hour a deep and heartfelt interest in the community he had so signally benefited in years gone by ; the Committee of the Liverpool Royal Institution now contemplate his decease with respectful and sorrowful emotion, and deem it a peculiar privilege to be entitled to enter on their records how truly they participate in the regret so universally felt on the removal, by death, of one so widely known and largely honoured, as the accomplished editor of the latest edition of the *Encyclopædia Britannica*, to which he so largely contributed.

“ Resolved—That a copy of this resolution be sent to the Literary and Philosophical Society.

(Signed,) “ EDWARD BANNER, Hon. Sec.”

A discussion followed as to how the Society could best mark its respect for the memory of Dr. Traill, in which the Rev. H. H. Higgins, Mr. James Smith, and the Secretary, took part; various suggestions were offered, and the matter was finally referred to the Council.

Captain Wilhelm Gutkäse, of the Oldenburgh barque *Australia*, was balloted for, and elected an Associate, on the recommendation of the Couneil.

The President, WILLIAM IHNE, Ph.D., then read the following

INAUGURAL ADDRESS.

GENTLEMEN,—Half a century has gone by, since this Society was founded. Half a century is a period not inconsiderable in the history of the human race. If a balance were drawn of all that has been gained and lost to mankind in such a number of years, it would, even in times of partial stagnation, be a comparison full of the most astounding results. But the last half century was not a period of stagnation. It was pre-eminently a period of never-lagging progress—of a progress such as no similar period of time since the dawn of history has surpassed or equalled. Good, honest work has been done by millions of workers. No field of human activity has remained fallow. The whole aspect of the surrounding world, over which man can exercise an influence, has been changed, and changed so thoroughly, that no imagination is powerful enough to reproduce the picture of the world in 1812. Even those few of us, who have lived through the whole of this period, must find it impossible fully and totally to realize the great change. As the child grows daily under our eyes, and as each successive development slowly and almost stealthily supplants the appearance of yesterday, and obliterates it from our memory, so in the growth of society we lose the consciousness of great changes produced, unless we can indelibly fix an impression on our mind, wipe out of it all intervening stages, and place by the side of the early picture the impression of latter days.

That which is so entirely impossible, I cannot venture even to endeavour to realize. It would require not only a super-human imagination, but also an all-comprehensive knowledge of things, which no individual human being can aspire to. But even an imperfect, a very imperfect comparison of our condition in 1862, with the condition of our fathers in 1812,

faulty and defective as it must necessarily be, may contain some portion of instructive truth, and seems not inappropriate at a time when we, as a Society, enter, as it were, upon a second portion of our career. It may contribute to inspire hope and confidence for the future, and it certainly will urge us on to increased exertions in our work, that our children, when they look back upon our days, may not point to us as laggards in the great work of the education of the human race.

In the year 1812, when a few good and thoughtful men met in this town to organise a Society for the cultivation of the arts of peace, the whole of Europe was ringing with the clang of arms from the Rock of Gibraltar to the snow-covered wastes of Russia. The great destroyer was still at work, and he was just then collecting his victims for a most horrible hecatomb. This island had put forth its whole strength, and concentrated all its energies for the work of human slaughter. Fortunately, her fields showed not the track of hostile armies —no ruined towns and smouldering villages betokened, as on the continent of Europe, the fearful ravages of war. The friendly element of the ocean girded her round “as a moat defensive to a house.” She truly proved—

“A fortress built by nature for herself
Against infestation and the hand of war.”

But that war was still a curse, and weighed heavily upon the land. All trade was paralysed by the mad endeavour of the enemy to shut out the produce of English labour from all the continent of Europe. Bread was dear, money scarce—even liberty shrunk from the stern word of military command. For a time, the development of constitutional freedom, which had marked England from all the nations of the earth, had come to a standstill. One imperative necessity, the struggle for existence, overruled all other wants and aspirations. It was a time of gloom, and almost of

despair. Her own children rose against the mother country. To the implacable foe, who, on the continent of Europe, had armed a million of men, were joined in hostility to England the free states of the American Union. War and the havoc of war on every side—discontent and depression at home—such was the condition of England in the year 1812.

At length the spell was broken. It was broken by the inordinate ambition, or rather by the madness of the French Emperor, intoxicated by twenty years of uninterrupted success. Napoleon returned a fugitive from Russia—all Europe rose in arms against him. He fulfilled his destiny in the lonely island, where disappointed ambition, like the eagle of Prometheus, preyed upon his vitals.

Peace returned once more, and the works of peace again engaged the attention of men bowed down and disgusted with war. Much had to be done, and much was done. In politics, in law, in social relations, in trade, in industrial pursuits, in art, in science, in education, in building, in planting, in draining, in making streets in the towns and roads in the country, in excavating docks and improving harbours for our ships, in saving life from shipwreck and disease, in thousands and thousands of directions the improving hand was set to work, and it wrought wonders.

It is the glory of England, that, through all the vicissitudes of her history, she has kept burning the sacred flame of freedom. When the whole of Europe was sunk in military despotism, the English Parliament met in free debate, and asserted a power superior to that of the sword. It is a still greater glory to this country, that she has communicated the sacred fire to her neighbours, and that in almost every country of Europe at the present day the principles of constitutional government, adopted with more or less success, have superseded the absolutism of an evil period. The whole of Europe now enjoys popular representation, with the exception of the

three states, where civil and religious power are combined in the hands of the ruler, *i.e.*, in Rome, Turkey, and Russia. Not everywhere is this representation perfect—not everywhere is it as yet fully secured against reactionary violence; but even where it is rendered nugatory by a temporary prevalence of despotic authority, its existence even in its weakness is a tribute paid to the spirit of liberty; even there its animation is only suspended—the living breath will return—the age of despotism is no more.

Whilst communicating freedom to the nations of Europe, England has not ceased to extend her own. Let any one compare the constitution and the laws of this country, as they were in 1812, with what they are now. Who can fail to be struck with the wondrous progress made? The great measures of Catholic Emancipation, the reform of Parliament, the reform of the municipal government of towns, the repeal of the Corn Laws, the reforms in the civil law, the abrogation of a barbarous penal code, the abolition of slavery, the freedom of trade and of navigation, the self-government of the colonies, the re-organization of the Indian empire, are only the most familiar and the most comprehensive of the numerous improvements made in this period so fertile in legislative enactments, and so universally pervaded by the spirit of justice, kindness and humanity. What has been done for the poor factory children, for the toilers in our mines and ships, for our criminals and felons, would be enough to characterize the age. And striking at the root of all social, intellectual, and even moral defects, the legislature has endeavoured to lessen the ignorance of the masses by giving with a bountiful hand the means for educating the people. How many were the villages, and the poor streets in our towns, which in 1812 could boast of a good school? How many of the working men could write their names, or read with sufficient ease to derive intellectual pleasure from books, or information from newspapers? It

may now be said with truth, that every child in this country of England has within its reach the means of a sound education, and thereby the means of rising in the social scale, or of becoming an intelligent and useful member of society.

If in our modern legislation we have successfully battled with the ignorance, the prejudice, the selfishness and the apathy of former days, we have been still more successful in exploring the laws of nature, in overcoming her obstacles, and in making her forces subservient to our well-being. Our success in this struggle is at once so vast, that I could not attempt to survey it at one glance, and so familiar to all of us, that it would be a waste of time to attempt it. We have seen in one generation the whole of this country, and a great portion of Europe and America, covered by a network of railways, which alone would have sufficed to revolutionize society. If we could imagine these iron roads swept away for one week, nay, for one day; if we could realize the possible result of such a calamity, we should then be able to form a notion of the wonderful change that has been operated. A faint idea can be formed by those who have witnessed the sudden paralysis caused in the traffic of mighty London some years ago by a strike of the London cabmen—a strike which lasted only a few days. The action of the imperial legislature was immediately called into play to remedy the evil, which fortunately was one remediable by the human will alone. But no legislative authority could restore our viaducts and tunnels, our engines and carriages, our wonderful railway machinery, if the force of mind that called them all into existence should suddenly cease to act, or if a convulsion in nature were to destroy the work of our hands. We should be as miserable mariners, whose craft had foundered on the high sea, and who were helplessly crowding into a frail boat.

Wherever we turn, we see the same results, the same triumphs of science. It is too trite to dwell on the luxury and

convenience which the rich and the poor alike enjoy by the introduction of gas, by the perfection of machinery of every kind, by the abundance, the cheapness, the good quality of the many thousand different products of our looms, our mines and our forges. We have become familiar even with the two most brilliant inventions of the last decennium, the electric telegraph and the photographic art. The speed of steam has become too slow for us, the art of the painter too inaccurate and too expensive. We convey intelligence with the rapidity of thought, and have made a limner of the light of the sun.

No field of human research has remained uncultivated. In natural science, we see a revolution begun before our eyes. The laws of natural development, of the growth of species, are on the eve of receiving an undreamt-of clearness ; chemistry has grown so rapidly, that the new discoveries of a few years back are almost antiquated. Science has discovered new modes of healing our infirmities, and has found the means of charming away all sense of pain under the terrible knife of the operator ; we have studied the laws that regulate the most unsteady of all elements, the winds and storms, and we can furnish the mariner with instruments and with knowledge, which will safely conduct him through hurricanes. The boundless realm of the starry heavens has been searched by our telescopes, and by science, more searching than the brightest speculum ; we have seen planets added to the solar system, and satellites to the planets. Our own planet has been explored to the impenetrable barriers that circle the poles, and to the dreary wastes which conceal the interior of the large continents. The scientific explorer has ascended the giddy heights of the Andes, and has floated higher than the Himalayas ; he has dropped the lead to the bottom of the ocean, and mapped out its bed. In every element, in every clime, science has courageously and gloriously laboured to understand the eternal laws of the all-wise Creator, and has

returned from her labours with some gain for man, and with a still deepening veneration for the author of this beautiful world.

It is hardly to be expected that we should have been equally successful in literature as in science, especially in that part of literature which is not scientific in its nature and operations—which deals more with the beautiful than with the true. The energies of an age are no more unlimited than those of an individual. When they are put forth powerfully in one direction, there must be a comparative pause and quiet in another. The man absorbed in analysing the qualities of a gas, or in tabulating the notations of barometers or anemometers—the man whose brain is at work all day, and often for long hours in the night, to reconcile phenomena, apparently discordant, under a law in which they shall harmoniously combine, will not, nay, he cannot, give his whole soul to the calm enjoyment of the beautiful. The poet, therefore, who reveals the secret working of human feeling, who paints the beautiful in the flower and the landscape, finds but a half attentive listener ; his heart fails him, and his muse becomes silent. It is no use deceiving ourselves. We live in a prosaic age. Not in England alone, but wherever we look among other nations, we find a restless activity of the mind ; but the poetic faculty, both creative and receptive, is for the present in a state of torpor. This is most perceptible in the drama, the highest walk of the poetic genius. The land of Shakspere has produced in the last fifty years no play that will live on the stage, and the latter-day productions of our play-wrights are utterly contemptible, and a disgrace to our age.

No field has been more productive in the last half-century than that of poetry in prose, *i.e.*, the literature of novels. Sir Walter Scott is the founder of a new era in this branch. His writings, which partly belong to the period I am speaking of, have kept their ground, and are a permanent acquisition to

English classical literature. Nor have his followers been wanting in success. The English novel has acquired the dignified position of a teacher of life, of character, and moral duty. The tone that pervades it, is, on the whole, serious, earnest, high. Some of our best men have devoted their pen to it, and have laboured to produce, not a passing amusement of the hour, but works of high art and merit.

Great and highly successful have been the labours bestowed during the last fifty years upon history. Historical criticism was firmly established by Niebuhr. His history of Rome has formed a new era in our investigations of that period of the past, which is anterior to the time of contemporary witnesses, and over which tradition has, therefore, thrown a veil of fable, fiction, and faint traces of truth. Whilst Germany may claim the credit of having established the canons of critical investigation, and of having collected vast materials for history, English historians have produced the most perfect works of historical art. Lord Macaulay takes a position by the side of the greatest writers of any age. No historian of either Greece or Rome, none of modern times surpasses him in beauty of style and arrangement, in depth of thought, in philosophical calmness, and impartial judgment. Macaulay has founded a new era for historical writing. He has narrated not only the great political events in a noble, dignified, and engaging style, but he has painted the inner life of the times ; he has reproduced the past not only in the palaces, the council chambers, and the battle-fields, but in the workshop of the artizan, in the merchant's house, in the fields where the peasant worked. Had he enjoyed health and life to finish his great work, it would have been sufficient in itself alone to establish the literary greatness of this age and country.

Several other names deserve honourable distinction by the side of that of Macaulay. The first comprehensive and masterly history of Greece was written by a London banker,

Mr. G. Grote. Mr. Hallam's works are proofs of conscientious labour, though they are not perfect in form and expression ; Mr. Froude, Mr. Merivale, and many other men of great ability have devoted themselves with more or less success to this branch of literature, which, if properly understood, is calculated to reconcile us with the present, to inspire hope for the future, and to free us from the errors and prejudices of the past.

Several endeavours have been made, both in England and abroad, to investigate the laws of historical development, but as yet with no great success. The most comprehensive attempt was made by the late Mr. Buckle, who unfortunately broke down, it appears, under the huge labour he had undertaken. That there are laws in historic development, there can be no doubt ; they are a combination of the laws of external nature, and of the laws of the human mind and of human action. The influence of these laws on the freedom of the human will, and the dependence of the whole on the supreme government of the world, which is in the hands of the Creator, constitute the difficulty of this subject, which still waits a solution from future inquirers.

One branch of historical research, not the least interesting, is that into language. Our century has devoted particular attention to this subject. We have studied languages, not only as in former times, to become acquainted with them in a given form. We have analysed them, we have searched their genesis, their development, their connection with other languages, and our discoveries have been startling. As in natural science we discovered analogies by the aid of scientific study, which were hidden from the common observer, so in languages we have found out affinities extending over all the chief dialects of Europe and far into Asia. We have established the fact of an Indo-European family of languages, and, as a matter of course, we have traced a historical connection between

the different races far beyond the period of the most ancient historical records.

Linguistic researches have also been made into the lost language of Persia. Cuneiform inscriptions have been brought to light, and, as it is alleged, deciphered. If future inquiries should prove this to be correct, it will be an astonishing triumph of scientific divination ; but at present it is not safe to approve or to condemn. Even the discoveries of Egyptologists, all the readings of hieroglyphics, and the chronology of Egyptian kings, are called into question by recent critics, among whom, Sir G. Cornewall Lewis, the Home Secretary of this country, wields the most formidable and destructive pen.

In classical literature much has been done, especially in Germany, during the last fifty years ; but in spite of the more brilliant scholarship of individuals, it is an undoubted fact that the mass of educated men are less familiar now with the writings of antiquity than our great-grandfathers used to be. The cause of this is, that the relative value of classical literature, compared with that of modern times, has been sinking for a long time. The great writers of Greece and Rome no longer supply food enough for our literary appetite. There are many ideas, interests, and feelings, which have become part of our nature, but which the ancients did not know of. Human life has become richer, deeper,—human thought more expanded,—human sympathies wider, than they were two thousand years ago. We have now a modern literature, which has grown out of our own civilisation, with which we are one, and which we are called upon to cultivate ; and we, consequently, have less sympathy with, and less time for the study of, the classical writers. They become more and more the peculiar domain of a separate class of scholars in proportion as they lose their hold on the mass of educated men.

The progress made in pure philosophy, in logic, psychology, and metaphysics is not very decided, though there has been

no lack of activity, especially in Germany and France. Systems of metaphysics have been built up with great depth, vigour, and boldness of thought ; but it will hardly be maintained, that any undoubted and permanent acquisition has been made. According to his *assumed* premises, every successive philosopher has been able to construct his system with logical sequence ; but it has not been difficult for succeeding thinkers to demolish the intellectual edifice by removing some portion of the foundation, which rested on mere hypothesis or assumption. The Infinite has not yet surrendered its inscrutable secret to the boldest and most persevering inquirers. We are still surrounded on every side by a dark veil, which no human hand seems ever destined to lift. Yet the repeated endeavours to solve the problem of existence and of final cause are not to be deprecated or deplored. They are a necessity of the human mind. As the hidden life of the plant unfolds its leaves to the light, so the mind of man will ever yearn to approach the source of all light. We cannot help ourselves, we must strive and struggle, and even though absolute knowledge be eternally withheld, in this our earthly existence, we cannot divest ourselves of that love of eternal truth, which is our noble attribute and a pledge of our higher nature.

But though the direct results of philosophical studies be but short glimpses at a truth still eluding our grasp, yet their secondary results are most beneficial. All other sciences culminate finally in pure philosophical science. Philosophy supplies the true methods of investigation—it furnishes the best principles of criticism—it is the air which they breathe, and by which they live—its stagnation or corruption would soon be followed by a general collapse of the human intellect, by a cessation of human progress, by a return of barbarism.

Gentlemen, what is the lesson, we learn from a survey of our progress in the period which has just elapsed ? In proportion as we are able to appreciate it, as we have knowledge

to follow the development in its various directions, as we have imagination to compare the past and the present, we must be struck with wonder and with awe at the great advance that has been accomplished. But stronger still must be our conviction, that our ignorance is greater than our knowledge, our weakness more decided than our strength, that our past success is as nothing to what lies still before us of struggles for truth, for wisdom, for justice, for happiness. We have seen, that no external accident has brought us so far. It has been hard work all through, work of the mind in the first place, then perseverance in realising objectively what the mind had discovered to be possible or desirable. From the time that Adam Smith explained the principles of unshackled industry, to the full realisation of the freedom of trade, what a long interval of years, what a series of struggles! So it has been with all great truths. Mankind cannot receive them like the light of the sun, which rises in the morning and sends its rays over the world without our asking or working for them. All intellectual, moral, and social improvement must be worked for, and can be appropriated only in the ratio of the honesty and universality of that work. Whoever does not lend his hand is not worthy to enjoy the benefits obtained by the workers: his heart must be intensely selfish, his appetites low, his mind torpid. Let us, gentlemen, disdain to belong to this class of men, a class unfortunately very numerous. Let us, each one in his own sphere, labour earnestly, patiently, lovingly. We cannot all make great discoveries; but there is not one of us, totally unable to contribute to the general store. I pity the disdainful, self-sufficient ignorance of those who, because they have themselves failed to master the rudiments of knowledge, think slightly of the endeavours of literary men and men of science. They want to see miracles; but even miracles would not induce them to put away their indifference to a cause they have not mind enough to understand.

Gentlemen,—It is not for us to boast of what we in this Society have already accomplished. But no more would it become us to indulge in a false modesty, and to say, that in fifty years we have contributed nothing to the general store, that has grown so prodigiously. Our volumes of transactions are sufficient evidence that we have not been idle. Many of the papers read before this Society are of great scientific value, and have been recognised as such beyond the limits of this town by the first men of this country, and even abroad. It would be invidious to single out those that might appear the most valuable and the most productive of results. I do not pretend to be able to fix the relative value of the several contributions to our transactions. Nor is this desirable. It is not individual papers, but the character of the whole that must decide our claim to be considered a learned Society.

Whilst congratulating the Society upon their past energy and the ability shown in many of the papers read here, I cannot help expressing my regret that, in a community like Liverpool, a community numbering nearly, if not quite, half a million, a town that boasts to be the second in the empire, a town productive of great men, there should be found no more than about one hundred and fifty members to form one of the first and oldest provincial learned societies, and among these members, very few indeed of the men of wealth and leisure. Is it that the fashionable air and aristocratic leaders are wanting, which make the London societies so attractive to many? Is it want of time? Let nobody plead engrossing business or overwork. Gentlemen, it is not lack of leisure, but lack of pleasure, lack of mind and knowledge, that keeps men from devoting themselves to intellectual occupations. Look at men like Mr. Gladstone, Sir G. C. Lewis, Lord Russell, Lord Brougham, Lord Campbell, Sir Bulwer Lytton, Mr. Grote. If they could find time in the most absorbing and mind-taxing occupations to write works that will for ever be ornaments to

the literature of England, surely, then, our merchant princes might afford to resemble the great Medici in more than a name. But, gentlemen, let us not look to the right, nor to the left; let us pursue the course marked out for us. However negligent others may be, who ought to stand by us, we are pledged to persevere in the investigation of truth. The future is not without hope for us. We are entering on the second half-century under encouraging auspices. Let us work honestly and increasingly, that it may be said in truth of our Society—

Vires acquirit eundo.

SECOND ORDINARY MEETING.

ROYAL INSTITUTION, November 3rd, 1862.

WILLIAM IHNE PH.D., PRESIDENT, in the Chair.

John Cameron, M.D., Captain Alexander Newlands, Mr. Robert Highat, and Mr. S. H. Behrend, were balloted for and duly elected members.

The PRESIDENT exhibited some pieces of pottery recently discovered at Chester, concerning which the age was somewhat doubtful.

Mr. MARTIN exhibited specimens of *Zostera marina*, the new cotton substitute proposed by Mr. Harben, together with some of the fibre obtainable from it, which led to a discussion upon its merits, the result of which was rather unfavourable to its value as a *substitute* for cotton, although it was admitted that it might probably prove a valuable *supplement*.

The paper of the evening was then read by the Rev. T. P. KIRKMAN, entitled—

AN EXAMINATION OF MR. MILL'S THEORY
OF THE CHARACTER AND PROOFS OF
MATHEMATICAL DOCTRINES.

(*Vide* "System of Logic," vol. 1, book ii, cap. v, 4th edition.)

BY THE REV. H. S. BYRTH, of Bardsley.

IN attempting to disprove the necessary and universal truth of geometrical axioms, Mr. Mill denies the real existence of geometrical figures, asserting that axioms are proved by experience, and that the test of inconceivableness fails ; but it is contended, first, that he ignores geometrical solids, which, on the principle of "sufficient reason," cannot be denied to exist, and are as irreconcileable with his theory as lines and points, while the existence of these latter is proved by that of the former. Secondly, that the axioms concerning geometrical lines are not true of any lines cognisable by experience, in any sense of the word, either legitimate or to the purpose. Thirdly, that Mr. Mill, professing to take his definition of necessary truth from Dr. Whewell, leaves out the most important qualifications ; that through forgetfulness of the ambiguity of the word "inconceivable," his examples are irrelevant ; that he does not produce one instance of propositions inconceivable (in the same sense as the denial of Euclid's axioms) at one time and conceivable at another ; that he thus leaves the test of unconceivableness untouched. Incidentally, his suggested substitution for an axiom of Euclid seems, on the most liberal interpretation, either to betray ignorance of the character of Euclid's reasoning, or to furnish an instance of false conversion. He also appears more than once, unconsciously, to concede the point in dispute. Such slips on the part of so eminent a logician would, in themselves, lead us to suspect the unsoundness of his theory.

THIRD ORDINARY MEETING.

ROYAL INSTITUTION, November 17th, 1862.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

In accordance with a new bye-law, ladies were, for the first time, invited to the meeting, and a large number were present on the occasion.

The PRESIDENT, on taking the chair, bade them welcome, and congratulated the Society on the response which its invitation had met with.

The SECRETARY laid the volume of Proceedings for the past Session on the table, and stated that it was ready for distribution among the members.

Dr. Collingwood announced that his friend, Mr. E. J. Reed, a gentleman with whose name every one was familiar, and who was at that moment, virtually employed by the Government to remodel our navy, was present at the meeting, and had kindly responded to his request to say a few words upon a subject which was of the utmost interest at the present time.

ON ARMOUR-PLATED SHIPS OF WAR.

BY MR. E. J. REED,

Secretary to the Institute of Naval Architects.

After apologising for addressing the audience so completely without premeditation, Mr. REED stated that the success of the Whitworth experiments arose from the nature of the projectiles employed, rather than from the nature of the gun. Cast-iron shot, when fired against armour-plates, crush up so instantaneously that they act rather as detached fragments than as solid masses. Malleable metal shots, on the contrary, spread out to an enlarged diameter at the moment of impact, and can only pass through the plate by forming a hole of corresponding dimensions ; but the hardened and well-tempered projectiles used by Mr. Whitworth, punch, as it were, a clean hole through the plate, of their own original size, and have therefore much less resistance to encounter than the Armstrong and other like shot and shell. It was to be observed, however, that the charge of powder which even the largest of the present Whitworth shells contained was comparatively small, although by carrying the same principle of construction further, an increased charge would doubtless be employed ere long.

After explaining the use of the timber backing behind the armour plates, and pointing out its reduced efficacy when opposed to Whitworth shot, Mr. Reed proceeded to say that he could well understand the astonishment, he might almost say the dismay, with which the accounts of the late experiments at Shoeburyness had been read in the *Times* by the

commercial classes a few days ago. It must have been most discouraging for them to learn that the colossal iron-cased ships upon which so many millions of the public money had been, and were being, expended, had proved vulnerable, not only to shot, but to explosive shells likewise; and the discouragement felt must be all the greater from the reflection that as the employment of iron of $4\frac{1}{2}$ inches in thickness had led to the construction of enormously costly vessels, the employment of much thicker iron still, to which we must hereafter of necessity resort, would in all probability render yet far more costly structures necessary. He confessed that a couple of years ago only, the report of Mr. Whitworth's success would have suggested apprehensions of that nature to his own mind. He was happy to be able to state, however, that the changes which had been made during the last few months in the construction of iron-cased ships under the auspices of our own Admiralty had prepared him to observe that success with equanimity. He hoped he should be excused if, under the circumstances of the moment, he ventured to refer to the vessels now in course of construction from designs of his own, because it was impossible to avoid that course in stating the grounds upon which his confidence was based. He would first remind his audience that during the whole of the Parliamentary debates of last year upon this question, little or no attention was given to the alarming fact that, although our entire fleet of small craft—that is our frigates, corvettes, sloops, and gunboats—had been virtually rendered useless, being timber-built, and unprotected with armour, yet no step whatever had been taken towards replacing them with iron-cased craft. In fact, it had been confidently pronounced impossible to protect any such classes of vessels with armour, and the consequence was that up even to April last the smallest iron-plated ships which had been commenced fell but little short of 4,000 tons burden, and several of these were protected in a most imperfect manner.

Without attempting to detail to his hearers the suggestions which he had ventured to submit to the Board of Admiralty, or the prompt and energetic measure which that Board had taken in the matter, he would inform them that a complete revolution had now been effected in this respect. That revolution had been effected silently; there had been no outcry of any kind got up in reference to it; he certainly had not himself trespassed on the public attention in the matter; but the change was nevertheless already practically perfected. Perhaps the best manner possible of indicating the nature of the change would be to say that the Admiralty were at the present moment building in Pembroke dock-yard an armour-plated sloop, completely protected with $4\frac{1}{2}$ -inch armour, and that that ship was not of 4,000, nor of 3,000, nor even of 2,000 tons, but of 1,250 tons burden only. She was to be a full-rigged steamer, of moderate draught of water, and was to carry provisions for four months' continuous service, so that she might be sent to America, the Mediterranean, the Pacific, or China, just as satisfactorily as any ordinary wooden ship. Unlike his first vessel, the *Enterprise*, she was moreover free from all experimental features, so that any number of such vessels might confidently be proceeded with. In order to bring the qualities of a ship of this class more fully before the mind, he might perhaps, be allowed to compare her with the ship which at present represented Great Britain in the harbour of New Orleans, where the peculiar habits of General Butler might at any moment create a difficulty. The vessel referred to is her Majesty's sloop *Rinaldo*, an utterly unprotected wooden vessel, carrying a comparatively light armament, and exposed, of course, to speedy destruction from shell fire. Contrasting this ship with the *Research*, he might say of the latter that she drew even less water than the other, was scarcely inferior to her either in sailing or steaming qualities, and was covered from end to end with armour of a thickness that had

hitherto proved impervious to both the shell and the shot of the United States navy. But it was not on account of her own qualities only that he referred to the Research class of war-ship, to which a much larger ship, the Favourite, also belongs, but because of the opportunity which her peculiar principle of construction afforded for meeting the increased power of the modern gun with an increased thickness of armour. It would be obvious to every one that a system of construction which had enabled us to reduce the size of our iron-cased ships down from 4,000 tons to little more than 1,000, will likewise enable us to increase the weight and thickness of the armour proportionately, provided we return to larger dimensions ; and he did not hesitate to say that, so far as the naval architect was concerned, there is positively no reason whatever why 9-inch, and even 12-inch, armour should not be employed upon our ships, and that, too, upon smaller ships than several of those now building. He might enlarge upon that phase of the subject considerably, if time permitted, and if it were prudent to disclose arrangements which are now in progress ; but he hoped he should be excused from doing so under present circumstances. He could not sit down, however, without adding a word upon that branch of the subject with which a great commercial town like Liverpool was more especially concerned—the pecuniary outlay expended upon the navy. The time had manifestly arrived when the time-honoured system of lavishing more money upon the navy must be for ever set aside. The old plan was, when any deficiency was felt to exist in that arm of the service, to spend a few more millions in the construction of ships of the style and character which were in fashion at the moment, with little or no regard to the possibility of improving them. This system gave us crowds of sailing ships long after the introduction of steam propulsion ; it gave us crowds of costly wooden line-of-battle ships after the French were known to be replacing theirs

with iron-cased vessels ; and it has given us an immense supply of half-built ships upon the stocks which nobody in the world knows how to deal with. What we have now to look to is, that it does not give us fleets of iron-cased craft constructed without reference to the certain development of the future. What we require, in fact, is to spend wisely every farthing that we do spend ; to give professional skill and science legitimate scope ; to expend brains as well as money, in short, upon the national work. Mere money only will not supply the necessities of this eventful period ; mere money will not even purchase security for the country. We have entered upon a keen and incessant competition with the brains and with the scientific enterprise of the world, and it requires all the administrative acumen and foresight that the Admiralty can exercise in order to carry us through so momentous a time. He had no fear whatever for our security, or our renown either, if scope were freely given to the skill and intelligence that, as a people, we possess ; on the contrary, he believed that the very changes and revolutions now in progress may, with wise management, be made instrumental in securing for us a more powerful and eminent position than ever.

At the close of Mr. Reed's remarks, he received the thanks of the Society for so kindly coming forward to speak upon topics of so much interest, and upon which, as it was observed, there was no higher authority, as was testified by the promptness with which the Board of Admiralty had carried out his views.

A paper was then read, of which the following is an abstract :

ON THE
MANUFACTURE OF STONE IMPLEMENTS
IN ANCIENT AND MODERN TIMES.

BY THE REV. A. HUME, D.C.L., F.S.A.

THE author commenced by noticing the arrangement of antiquities made by Mr. Thompson, of Copenhagen, into those of the bone, stone, bronze, and iron periods; since, by that means, degrees of civilisation might be studied geographically over the world, as well as historically in the modern seats of civilised nations. His objects for exhibition and illustration comprised a triturating stone, with roller and rubber—the former from Ireland, the latter from Fernando Po; querns; numerous examples of the stone malleus; hand war clubs from New Zealand; celts, wedges, &c., from Denmark, Ireland, England, Fiji, and New Zealand; flints from the drift on the banks of the Somme; flint arrows, combs, fish-hooks, &c., from Danby Moor, Yorkshire; and numerous flint flakes, sling-stones, &c., in general from the east coast of Yorkshire.

The triturating stone, still used in New Mexico, and occasionally by the Caffres at the Cape, is a first approach to grinding. It is not very different from the two stones between which the Australian natives pounded the seeds in the expedition of Burke and Wills. In the countries which have progressed, this was succeeded by the pestle and mortar, and then by the quern, the wind-mill, the water-mill, &c. The quern was usually turned by two persons, as it is still in the Scottish Highlands, and the labour was regarded as very servile, hence slaves and captives were frequently employed in per-

forming the task. Though modern millers have laboured to destroy the stones, they are still found, from the eastern side of Asia and the west of Europe; and in the countries of primitive habits, they are still in actual use. Numerous quotations were given from our old English literature illustrative of its use in former times. The malleus, or hammer, was of various forms, often like the sledge-hammer of a smith, a wooden handle passing through its centre. In the eleventh century, the Anglo-Saxons used "bipennis" and "stan-ex" as convertible terms, so that they seem to have used such stone mallets, or to have thought that the Roman bipennis was of that shape. Many of those are found in connection with the bones of large animals now quite extinct. Several elegant hand war-clubs were exhibited, from New Zealand—one of elegantly carved wood, and another of stone. Those of black stone are identical, in form and size, with specimens found in England and Ireland; but a rare and curious one was shown of the favourite material, green-stone. A piece of this had been hidden during the disturbances at Massacre Bay, and so valuable was it supposed to be, that a space of ground, four or five acres in extent was dug over to a depth of four feet for the purpose of finding it. Ancient green-stone axes have also been found in our own country, as well as in France. An object of this kind is sometimes called a "sacrificing axe," and the making of it occupies a man, at intervals, about two years. He rubs it with a small flint stone of the size of a walnut, or a small egg. The chisels, or wedges, are still more varied in their forms, their uses, and the places in which they are found. Several of them were shown mounted, for the purposes of war or the chase; some were shown blocked out, others partially ground, and some with defects taken out of them by grinding. In a few instances objects in metal had been imitated, in form, by subsequent ones in stone. No objects were shown mounted in stags' horn; but it was stated that these are of frequent

occurrence in the crannoges of Ireland, the lacustrine habitations of Switzerland, and in some of the cuttings in France.

In drawing attention to the flint arrow-heads and chippings, Dr. Hume noticed the valuable researches of M. de Perthes, of Abbeville, who had added a new and important chapter to science. He has shown that instead of archæology "piecing on" to geology, the two interlace or overlap; the human or archæological period, having preceded several of the changes of a geological kind. On this part of the subject, however, he touched but briefly.

At the conclusion of the paper, Mr. H. DUCKWORTH exhibited some flint weapons from the gravel of the Somme, and made some remarks upon them.

Dr. COLLINGWOOD referred to the recent discovery of lake habitations in Norfolk similar to those found in Switzerland, and made some observations regarding the antiquity of the human race, as shown by the drift deposits of the Somme.

FOURTH ORDINARY MEETING.

ROYAL INSTITUTION, 1st December, 1862.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

Thomas Hakes, Esq., was balloted for and elected a member of the Society.

A short paper was read by M. Jules Gérard, "Sur les habitudes du Lion dans l'état sauvage."

The following paper was then read—

THE ANCIENT GOTHIC LANGUAGE, IN ITS
RELATION TO THE OTHER INDO-
EUROPEAN TONGUES.

By J. A. PICTON, F.S.A.

PART II.

IN the former part of this paper, I endeavoured to shew that the Gothic language is intimately connected with our own mother tongue; that it is very near the point of convergence of all the Teutonic dialects; that it gives the key to many of the peculiarities which distinguish this sub-family of tongues; that by its copious system of inflexions it indicates its common origin and affinity with the Sanskrit, Greek, and Latin. I propose in the second part to continue the inquiry by reference to the vocabulary, as still more closely identifying the language with our own; and by an occasional glimpse into the common radical connexion of all the branches of the great Aryan family. In doing so, I cannot but feel that I have to contend with two difficulties of a kind quite opposed to each other. A superficial glance at a page of English and Gothic placed side by side would excite a sceptical smile at the idea of any connexion existing between the two. On the contrary when the analysis has been carried out, and both are reduced to their simple elements, the connexion appears so obvious as to need no argument in proof. The subject is one of deep interest, as illustrating what written history fails to disclose. In the eloquent words of Max Müller—"Few men perhaps will be insensible to the pleasure we derive from being able to watch in the course of our studies the gradual growth of any form of human speech. The history of words is the reflexion of the history of the human mind, and many expres-

sions which we use in a merely conventional sense are full of historical recollections if we can but trace them back to their original form and meaning.”*

This is perfectly true, but it may be added that the study of words carries us back beyond the dawn of history, and throws a light upon the manners, habits, modes of thought and of life in remote ages, which have left no historical memorials behind.

It may be fairly stated that whatever terms we find in a language, native, not derived, represent ideas and things existing and familiar among the people who spoke the language. Acting on this principle, let us test the Gothic language, and ascertain as far as we may, both the relation in which it stands to ourselves, and the light it throws on the condition of our forefathers fifteen hundred years ago.

It matters little where we begin. As a familiar subject of comparison, let us take the Lord’s Prayer. I give it in Gothic, Anglo-Saxon, and modern German. With the modern English we are all familiar. That our own vernacular tongue is the lineal descendant, the living representative of that spoken by the Angles and Saxons admits of no doubt; but the term *Anglo-Saxon* seems almost to ignore this, and to convert the speech of our forefathers, the old, “*Englisea spræca*,” as they termed it, into a foreign language. Whatever connexion, therefore, we establish between the Anglo-Saxon and any other tongue, must equally apply to modern English in its radical and inalienable features, however the lapse of time may have modified its external forms.

GOTHIC.

Atta unsar thu in himinam ; veihnai namo thein.

Qimai thiudinassus theins.

Vairthai vilja theins sve in himina jah ana airthai.

* “Survey of Language,” p. 16.

Hlaif unsarana thana sinteanan gif uns himma daga.

Jah alet uns thatei skulans sijaima svasve jah veis aletam thaim skulam unsaraim.

Jah ni bringais uns in fraistubnjai ; ak lausei uns af thamma ubilin.

Unte theina ist thiudangardi, jah mahts, jah vulthus, in aivins. Amen.

ANGLO-SAXON.

Fœder úre, thu the eart on heofenum, si thin name gehalgod.

To-becume thin rice.

Ge-woorthe thin willa on corthan, swa-swa on heofenum.

Urne dæghwamlicam hlaf syle us to-dæg.

And forgyf ús úre gyltas, swa-swa we forgyfath úrum gyltendum.

And ne gelæde thu us on costnunge, ac alys us of yfle.

MODERN GERMAN.

Unser Vater in dem Himmel, dein Name werde geheiligt.

Dein Reich komme ; Dein Wille geschehe auf Erden, wie im Himmel.

Unser täglich Brodt, gib uns heute.

Und vergieb uns unsere Schulden wie Wir unsren Schuldigern vergeben.

Und führe uns nicht in Versuchung, sondern erlöse uns von dem Uebel.

Denn dein ist das Reich, und die Kraft, und die Herrlichkeit, in Ewigkeit. Amen.

Omitting the doxology at the close, which the Anglo-Saxon version, being translated from the Vulgate, does not contain, the Gothic contains 53 words, the Anglo-Saxon 50, the German 48. Of the 53 Gothic words, 18 are repetitions or inflexions, leaving 35 distinct forms. Of these, 31 are

common to all the three languages, a few of the German ones being only found in the old dialect; one is common to the Gothic and German only, one to the Gothic and Anglo-Saxon only, two are somewhat doubtful, leaving none exclusively belonging to the Gothic. Of the fifty Anglo-Saxon words, nineteen are repetitions or inflexions, leaving thirty-one distinct forms. Of these, twenty-eight are common to the three languages, one is common to the Anglo-Saxon and Gothic, one to the Anglo-Saxon and German, and one doubtful (*heofenum*). Of the forty-eight German words, sixteen are repetitions and inflexions, leaving thirty-two distinct forms. Of these, twenty-nine are common to the three languages; one is common to the German and the Anglo-Saxon; one is common to the German and Gothic, and one is doubtful (*himmel*). Of course, the resemblance of the common words is of a radical character. Although in many cases it is sufficiently obvious at first sight, in others it requires a somewhat close analysis to demonstrate the connexion. Let us take a few words at random in illustration.

The word "kingdom," occurs twice in the Lord's Prayer. The Anglo-Saxon and German terms are the same; German, "Reich;" Anglo-Saxon, "Rice." The Gothic has two terms, "Thiudinassus," and "Thiudangardi." These are compound words, the separate terms of which are common to the sister tongues. "Thiuda" signifies the nation or people; Anglo-Saxon, "theod;" Old German, "Deut," or "Diot."* "Gut-thiuda," was the name by which the Gothic people called themselves. The radical "thiu" branches out into a large number of derivatives in the various Teutonic tongues. Originally, it seems to have conveyed the idea of property

* From this Old German word "Diot," is derived the modern word "Diet," as applied to a conference representing separate states or provinces, as "the Diet of Worms," &c. From the form "Diut" is derived the German national appellation, "Dentsch," anciently "Diutiska," signifying the race or people *par excellence*. See Pictet, *Orig. Indo-Europ.*, p. 84.

lying at the root of social union. “Thiuda,” Anglo-Saxon, “theod,” is the common-weal, the collective institutions of the state. The Gothic “thiuth,” like the English “good,” is used to signify both moral qualities and temporal blessings. Luke 1, v. 53—“He hath filled the poor with good things;” “gredagans gasothida thiuthe.” “Guth sa thiutheiga,” the blessed God.

As property among the wandering Teutonic tribes consisted to a great extent of slaves and captives, the word naturally came to express this idea. The Anglo-Saxon “theow” is used in this sense for a bond servant. Our modern word “thew” has a double descent from the Anglo-Saxon, and is used in two senses. As derived from “theow,” it signifies brawn and muscle, as in “Hamlet”—

“Nature crescent does not grow alone
In *thews* and bulk.”

As derived from “theaw,” a word from the same root, it implies manners, morals, behaviour, as in Spenser—

“For well ye worthy been for worth and gentle thewes.”

It will be seen that the same primary idea of gifts, attainments, presents itself in each. The second part of the word, “nassus,” is identical with our termination, “ness,” in such words as “idleness,” “business,” &c. In our old word, “heathenesse,” it is used in exactly the same way to convey the concrete meaning, as in the Gothic “thiudinassus.” The second term for kingdom, “thiudangardi,” is literally the “guardianship of the common-wealth.”

The other term for king and kingdom, “reik-s” (Latin “rex”) though not found in the Lord’s Prayer, is very extensively employed in the Gothic. It was used as a common suffix to the names of the rulers, as “Ala-ric,” king of all. “Theodoric,” properly “Thiuda-ric,” king of the nation;

“Herman-ric,” warrior king; “Fritha-ric,” or “Frederic,” king of peace; “Rode-ric,” eloquent king; “Athana-ric,” chosen king; “Ricimer,” or “Emmeric,” king for ever.*

I propose, in the short space which I can claim for the present paper, without any very definite plan, to inquire into what ideas we have in common with our ancient kinsmen of the fourth century, and what insight we can derive, from the language as it then existed, into their habits and condition.

Whatever the Gothic tribes might have been in their original condition, in the fourth century, they were certainly an agricultural people. Most of our agricultural terms now in use were then employed in the same sense as now. “Land” and “ground” are words common to all the Teutonic tongues.

“Akr” (Eng. “acre,”) signifies a cultivated field; originally it meant a piece of land enclosed by a mound. Latin, “agger.”

Compare	Greek	<i>ἀγρός.</i>
„	Latin	ager.
„	Anglo-Sax.	æcer.
„	German	acker.
„	Swedish	öker.

From this comes “akran,” fruit. The English “acorn” has usually been derived from oak-corn, but this etymology is extremely doubtful. The German “ecker,” the old Norse “akurin,” are evidently the same word, but have no connexion with “corn;” the Norse term, like the Gothic, signifies fruit in general.

* This last appellation has had a singular fortune. “Emmeric” became a favorite German name. Transferred to France, it took the form of “Alueric,” shortened to “Aymer.” It was Latinised into “Emericus,” and carried over the Alps into Lombardy, was softened into “Amerigo,” the baptismal name of Vespucei, who claimed the discovery of the continent of America, and conferred his name upon it. Amongst the various sources of self-glorification of the bearers of the “Star-spangled Banner,” it is rather remarkable that no orator should have alluded to the proud prognostication of greatness conveyed in the name itself—“monarch for ever.”

To plough was expressed by “ arjan.”

Anglo-Saxon, erian.

Old German, aran.

Greek, *ἀποῦνται*.

Latin, arare, aratrum, arvum.

The history of this word is curious and interesting—pointing backwards to the earliest origin of Indo-European civilisation.

The Sanskrit root, अर् ar, has the primitive idea of motion forward, and in the causative form that of pushing or causing to go. When the cultivation of land was commenced by ploughing, this word was applied to the operation, and is found in every Indo-European dialect in some form or other. It was thence extended to any work which required skill, as—

German, ar-beit.

Gothic, ar-baith.

Latin, ar-s.*

In the course of time the distinction between the nomad tribes and those who cultivated the land became marked, and the latter were naturally designated by their distinguishing characteristics, as Aryas or ploughmen. The name thus connected itself with the progress of civilisation, and became a title of honour which the nation was proud to apply to itself. Hence in the Vedas we find Arya signifies faithful, devout, excellent. It is especially applied to those of pure race in contradistinction from persons of inferior caste. Aryavarta, the country of the Aryas, is anciently applied to Brahminical India par excellence. We find the name extended westward, and trace it in such names as Aram, Ararat, Armenia, Arimaspi, &c. We find it in the Greek *ἀἴρω*, to elevate, to extol; in the Irish “ er,” noble. Pictét derives Hib-er-nia, Ib-er-ia, from “ Ibh,” country, and “ er,” noble, the country of the noble people.

* Thus, in Latin, “ Art-ifex ” signifies a skilled workman, an artist; “ Opifex,” a common workman.

At what period the term “plough” was introduced and superseded the old “arjan,” in the Teutonic and Norse tongues, we can only conjecture. It is not found in Gothic, and is rarely met with in Anglo-Saxon. It must, however, have been introduced at an early period, as we find it in the

Old German,	pflug.
Frankish,	phluog.
Norse,	plog.
Old Low German	ploeg.

It was probably introduced when the form of the instrument was changed. The original “ara” was, like the Roman and Hindoo plough, calculated merely to scratch a furrow without turning over the soil. The change of form by the introduction of the mould board would naturally lead to a term for the new instrument expressive of turning over, which appears to be the radical meaning of pflügen. We find the idea in the Greek Πόλεω, which is applied in the same manner, and means both to turn over and to plough.

Many of the terms connected with rural life are identical with our own, as—

Grund-u,	Ground.
Gras,	Grass.
Hav-i,	Hay.
Haith-i,	Heath.
Wait-eis,	Wheat.
Bar-is,	Bear or Barley.
Seth,	Seed.
Kaurn,	Corn.
Land,	Land.
Lein,	Linen, Flax.
Hug-s,	Hedge.
Triu,	Tree.
Sakkus,	Sack.
Vein-a,	Wine.
Vinth-jan,	to Winnow.
Thriskan,	to Thrash.

With many others.

The terms in connexion with a Gothic household fifteen hundred years ago were not very dissimilar from our own. Our word "home" is represented by the Gothic "haim." This word is found in all the Teutonic dialects, with slightly different shades of meaning—

Old German,	heime.
Modern German,	heim.
Anglo-Saxon,	ham.
Old Saxon,	hem.
Swedish,	hem.
Danish,	hjem.

The Greek Κώμη appears to have the same origin. The primary idea is that of a common habitation. In Gothic, it is used for village, as in the common Saxon termination, "ham." A family was called a "heiv," a name certainly indicative of industry, but now restricted to a community of bees. The master of the house was called the "heiva-frauja."

The name of their habitation was called "hus," house; the door, "daur;" the door-keeper, "daura-wards," or door-ward.

One would like to verify the etymology of Horne Tooke, identifying this word with the preposition "through;" Gothic, "thairh;" the connexion appears to be very natural, but, unfortunately, they do not coalesce. The words occur in every Teutonic tongue; in the Low German dialects, the substantive begins with "d," and the preposition with "th." In the High German it is reversed, but in no case do they so approximate as to give any indications of a common source.

Even in Sanskrit, the terms are separate; द्वा dwár (door) has no connexion with परा para (through, or beyond). A window, in Gothic, was called "auga-daura," eye-door; the roof, "hrot;" Anglo-Saxon, "hrof," from "hrœfan," to hold fast; hence a "reef" in a sail. Greek, *o·ροφ·η*.

Gibla, the gable.

Ubizva, the eaves.

Hauri, the hearth.

This originally meant a fire kindled on the floor; so in St. John, 18, v. 18—"haurja vaurkjandans unte kald vas;" "making a fire because it was cold."

Baurd, a table, a board.

Mes, a dining table, a board. Anglo-Saxon, myse.

Hence, the terms "mess," "mess-mate."

Mat,	meat,
Itan,	to eat.
Fodjan,	to feed.
Hlaif,	loaf—bread.
Miluk,	milk.
Salt,	salt.
Aurts,	vegetables, hence
Aurti-gards,	Eng., orchard.

Furniture was, doubtless, in the time we are speaking of, very simple. The terms employed were, however, the forerunners of our own. Whilst dining off the "baurd," or "mes," they sat on a "sitol," Old Eng., "settle," or on a "stol;" Eng., "stool." These words are employed with the most dignified associations, a monarch's throne is only a "sitol." A judgment seat is the "stana-stol." "Bad-i" was the name for the couch of repose, as "bed" is now. They fastened their doors with a "luka," as we do now with a lock. When weary, they rested their lower limbs on a "fotu-baurd," as we do now on a "foot-board" or "foot-stool." When visited occasionally by a "gast," Eng., "guest," he was waited on by the "mavi;" Eng., "maid." The domestic relationships—

Fadr, Sunu, Dauhtar, Barn,

sufficiently identify themselves. When sick, they were visited by the "leikeis;" Old Eng., "leech;" and when conquered by "dauths," "death," they were finally laid to rest, as we shall be, in the "grab;" Eng., "grave."

The "qairnus" (quern) or hand millstone was amongst the Goths, as amongst all the Teutonic and Celtic nations, the usual implement for grinding corn; but it appears that, in the

fourth century, an advance had been made beyond mere hand labour. In St. Mark's Gospel, ch. 9, v. 42—where the passage occurs—“It were better that a millstone were hanged round his neck,” in place of the phrase, “λιθος μυλικος,” some Greek manuscripts read, “μυλος ονικος;” literally, “ass-mill-stone.” This appears to have been the reading in the manuscript employed by Bishop Ulfilas, who has rendered it in a manner which shows that the idea was quite familiar. “Asilu-qairns.” That these primitive machines were employed about that period by the Teutonic races there can be no doubt. About the middle of the last century in the south of France, the remains of an ancient villa of the Frankish period were excavated and brought to light. Amongst these were found a pair of millstones of the usual hand-quern form, but of larger size, into the upper of which an arm was fitted, with a yoke to which an ass was harnessed,* exactly realising the idea in the text.

The names of most of the domestic animals were identical with our own—

Auhs-a,	ox.
Stiur,	steer—bull.
Kalb-o,	calf.
Gait-ei,	goat.
Lamb,	lamb—sheep.
Vithr-u,	wether.
Svein,	swine.
Avi,	ewe.
Asilus,	ass.
Fula,	foal.
Hund,	hound—dog.
Dius,	deer.
Dub-o,	dove.
Han-a,	hen.
Fugl,	fowl.

It might naturally be expected that the race whose warriors

* *Arts et Metiers des Anciens, representés par les Monumens; par Grivaud de la Vincelle.* Paris, 1819.

sacked the city of Rome, and established the kingdom of Italy on the ruins of the Roman empire would possess a native vocabulary for arms and warlike terms. Many of these have been superseded in later times. Others are common to the whole race.

“ Skild-u,” shield, is common to the whole of the Teutonic tongues—

Old German,	skiölder.
Modern German,	schild.
Anglo-Saxon,	scyld.
Swedish,	sköld.
Danish,	skjold.

The root from which this term is derived is common to all the Aryan languages, and presents the general idea of covering. Compare Sanskrit, **छाया** chháyá, a shadow.

“ Vepna” is the same word as our “ weapon,” and is used for arms or armour in general, whether offensive or defensive, equivalent to the Greek *ὅπλα*, for which it is used. It is found in most of the kindred dialects—

Anglo-Saxon,	vöopen.
Old German,	wafan.
Modern German,	waffen—wappen.
Swedish,	vapen.
Danish,	waaben.
Holl.	waepenen.

The Goths and Old Germans divided weapons into three kinds, “ hogg-wapn,” cutting instruments, such as swords ; “ lägg-wapn,” thrusting instruments, as spears ; and “ skott-wapn,” shooting instruments, as javelins and arrows. The “ vepna,” or weapon, possessed an important signification in their public assemblies, and in their jurisprudence. Our modern expressions of opinion in public meetings are derived from our Gothic ancestors. According to Tacitus, when they were displeased, they expressed it by groans ; when they were

pleased, they struck their shields with their weapons, as we now thump the tables, or give the “Kentish fire.”*

The term “wapentake,” preserved to our own times as the name of a judicial court, is a relic descended to us from the remote forests of Germany. The court was so called from the fact that when sentence was pronounced the judge held out his spear, which all present touched in token of assent.†

The origin of this word is curious and significative, as giving a glimpse of the pre-historic condition of the Teutonic race. The etymology has been glanced and guessed at by lexicographers, but, so far as I can find, has not hitherto been demonstrated. Though afterwards used for arms in general, there is evidence to shew that originally it was limited to defensive armour only. Ihre observes (sub voce,)‡ “*wapn* proprie veteres significasse theracem, galeam, ocreas, et cetera, quæ in prælium abeuntes induebant.” He further offers an opinion that *waffen*, *wapn*, &c., are derived from a lost root signifying to plait, to bind round, “*orta sint a radice deperdita, quæ involvere cingere notaverit.*” We find in Gothic, “*vaip*” used for the plaited crown of thorns; also “*veipan*,” for the act of placing the wreath on the head of the victor at the Olympic games. The latter word is closely connected, if not identical, with the Anglo-Saxon *weffan*, or *webban*—

German,	Weben.
Old Low German,	Wippa.
Latin,	Viere,
To twist or weave.	

Without going into further particulars, it may be stated that we are led insensibly, as the ultimate result, to the

* “*Si displicuit sententia, fremitu adsperrantur; si placuit, frameas concenuntur.*”
—Tacit. De Mor. Ger. ch. ii.

† “*Vapnatake* confirmatio sententie in judicio prolatæ per contactum armorum, lectis enim suffragiis de causâ examinatâ iudex proferebat, quam adsesores omnes tangentes, sententiam confirmabant, dænt mid vapnataki armorum tactu judicatum.”—Varelius Ind. sub. voe.

‡ *Gloss. Suio-Goth*, 1098.

Sanskrit root, वै, which embodies the idea of weaving and sewing, and which is found throughout all the Aryan tongues. From this inquiry we may fairly infer that the terms *wepn*, *wapn*, &c., originally signified a woven substance, as *wepa* and *waipa* do still in Icelandic. It would further appear that the first defensive armour of the Goths was nothing more than a thick woven or quilted garment; that from thence it extended first to defensive armour of whatever substance made, and afterwards to arms in general.

I have dwelt at some length on this term, principally to shew the extent of inquiry which may be opened up by a single word, and the interest which may be derived from the study conducted in the fair spirit of analytical inquiry. To those who have not entered upon the study, it may seem a little singular that the words *wife*, *whip*, *weave*, and *weapon*, should all be derived from the same original.

That the Goths were not without metallic armour is proved from the native terms employed.

“Hilm,” helm-*et*, is found in all the Teutonic dialects in nearly the same form. The root of this word is found in the Old Norse, “hilma;” Anglo-Saxon, “helan;” German, “hüllen,” to cover, which branches out into a variety of significations. In the days of chivalry, the pieces of tapestry which were thrown over the benches in the manner of modern antimacassars, were called “hullings.” In the Lancashire dialect of the present day the cover of a book is called the “hilling.” In Anglo-Saxon, a crown is called “cyne-helm,” or king’s helmet, as in John, ch. 19, v. 5, “thyrnene cynchelm” is used for the crown of thorns. “Helm” was also used in the sense of protector, as a component part of proper names, *e.g.*, “Adhelm,” noble protector; “Friedhelm,” defender of peace; “Wilhelm,” defender of repose.” It is an evidence of the martial influence of the Goths during the decline of the Roman empire, that the ancient terms for helmet, “galea” and

“cassis,” should have been abandoned both in Low Latin, Italian, Spanish, and French, for the Teutonic term “helm,” slightly modified.

“Arw-asna,” arrow; Anglo-Saxon, “arewa;” Old Low German, “ör;” Swedish, “arf.” This term is not found in the High German, where “pfeil” is the substitute; Latin, “pilum.”

The use of the bow was not common amongst the Goths at the earlier period of their history, not being mentioned either by Cæsar or Tacitus as amongst their weapons; but there is abundant proof of its use at a later period.

Many of the military terms now obsolete were common to the Goths, and our Anglo-Saxon ancestors.

Heer, army.

Sigis, victory.

“Hansa,” a troop, league, or association, whence the origin of the “Hanse towns.”

Brunjo, a breast-plate.

Anglo-Saxon, Byrn.

Old German, Brun.

Swedish, Bryn-ja.

Old French, Brugne,

From “Brun,” the breast.

In the Constitutiones Caroli Magni, we find a law—“Bauga et brunnia non dentur negotiatoribus,” “bows and breast-plates not to be furnished to tradesmen.”

The employment of the metals as coined money forms an important epoch in the advance of a people from barbarism to civilization. In the fourth century, the Goths seem to have been in a transition state in this respect. Amongst all the Aryan races cattle has been the original representative of property, and the first medium of exchange. The Sanskrit term for cattle, पशु pasu has passed into the Greek πῶν, πάσω (to possess)—

Latin,	pecu.
Gothic,	faihu.
Anglo-Saxon,	feoh.
Old German,	fihu.
Modern German,	vieh.
Swedish,	fā.
Danish,	fœ.

In the whole of these, with the exception, perhaps, of the Greek, the term has been interchangeable with wealth in general. From the Latin “pecus,” we have “peculium,” private property; “pecunia,” first, property in general, and then coined money; so in the Anglo-Saxon “ewic-feoh,” or “gangend-feoh,” applied to cattle or sheep; “liegend-feoh,” to immoveables; and “weorc-feoh,” to property in slaves.* The same analogy holds good in the Old German and Norse languages.

Where coined money is specially alluded to in the Scripture and elsewhere, the Gothic version usually employs the foreign term untranslated, as “drakma,” for Greek $\delta\rho\alpha\chi\mu\eta$; “unkja,” for Latin “uncia;” “sikl,” for Hebrew “shekel.”

In other cases the Greek $\alpha\rho\gamma\delta\rho\mu\alpha$ is literally rendered by “silubreins,” pieces of silver. The most general word employed, whether to express the Greek $\alpha\rho\gamma\delta\rho\mu\iota\nu$, the Latin “denarius,” or “mina,” is “skatts,” a term running through all the sister tongues—

Old German,	skazz.
Modern German,	schatz.
Old Saxon,	scat.
Anglo-Saxon,	sceat.
Old Frisian,	sket.
Swedish,	skatt.
Danish,	skat.
Holl.	schat.

The general meaning is that of treasure, property in general,

* Mat. 10, v. 9—“Næbbe ne gold ne seolfer ne *feoh* in eowrum bigyrdlum;” neither gold nor silver, nor brass in your purses.

and by a secondary application, that of money. The derivation of the term, though it seems to have escaped the notice of Wachter, Ihre, Junius, and our older etymologists, is not far to seek, if we keep in mind the leading idea involved. The first notion of a circulating medium seems to have been, not that of trade or barter, but of obligatory payment, or compulsory tribute. "Skolan," "skila," "skulle," &c., in the old Teutonic dialects expressed obligation or debt, particularly the fines for homicide and other breaches of the law.* Some name must have been given to the property used for the purpose of paying the fine, and "skat," "skeat," &c., the terms so employed, seem to have been derived from the verb expressing the obligation, in the same way that "gelt," money, is derived from "gelten," to owe or to pay. The change of vowel from "u" to "a" in forming the substantive is the ordinary rule in Sanskrit, as "kavi," a poet, from "ku," to sound; "plava," that which swims, from "plu" to swim. The German "sollen," English "shall," are derived from the same original; also the old term "scot," as applied to a tax, and the old English "shot," descended to our own times for a score at a tavern. It is confirmatory of this derivation that the "shilling"—

Old Low German,	skillingr.
Anglo Saxon,	scilling.
Swedish and } Danish,	skilling.
Holl.	schelling.
German,	schilling—

appears to have been the first coined money of the Teutonic races, and according to Wachter has the derivation alluded to above. The word originally meant a fine; "laga skilling," a fine imposed by law, and then passed to the piece of silver used for the purpose.

* So "skalk" signified a bond-slave, one who could not pay his fine for offences, and was therefore reduced to servitude.

“Schilling,” is not found in the Old German, nor in the Gothic translation of the Scripture. It is, however, found in the Neapolitan fragments of the 5th or 6th century. In the Anglo-Saxon version of the New Testament, the word is used frequently as equivalent to the Greek “ἀργυρία.” It may, therefore, fairly be inferred that coined money was first used by the Goths and Saxons about the fifth century of our era. There is one word for money in the Gothic version which is a little perplexing. In Mat. 5, v. 27, “thou shalt not depart thence till thou hast paid the uttermost farthing; the Greek κοδραντης is translated by “kintus,” a term found nowhere else, and of which the radical meaning and the derivation, are quite unknown.

Proceeding on the principle that native terms in any art imply an indigenous origin, unless they can be shown to be translations; the origin and progress of letters amongst the Gothic races presents a most interesting field of inquiry. The space at my command forbids me entering upon the subject with any minuteness of detail, but I will endeavour to state with as much brevity as possible the general conclusions arrived at from a somewhat extensive area of investigation.

The original terms for writing in the whole of the Aryan languages, in their primary meaning signify cutting or scratching. They are as follow—

Sanskrit, लिख् likh.

Greek, γράφω.

Latin, scribo.

German, schreiben.

This last is commonly supposed to be derived from the Latin, but from the general diffusion of the same radical through the Teutonic tongues, it is more probably of native growth. It is found in the

Swedish, skrifwa.

Low German, schrywen.

Icelandic, skra;

and in these cases it signifies "to write," in our sense of the term; but originally it meant to scratch or cut, in which sense alone it is found in the Gothic "skreitan," to cut or tear; Anglo-Saxon "screopan," to scrape.

It is also found in the Celtic tongues—

Hibernian, schriobham.

Cambrian, ysgrivenny.

Breton, skriva,

where it means to write. In the old Norse dialects it was also used in the sense of drawing and painting. Our word "write" is found in the Anglo-Saxon, "writan," which is employed in the modern sense. The Norse "rita," signifies both to draw and to write. The German "reissen," now only used to express cutting, tearing, and sketching, formerly meant also to write.

This may suffice to show the original idea involved in the expressions for writing. The only exception to this is the Gothic language, in which the term for writing points, as I will show hereafter, to an altogether different origin.*

All the original terms for books, writings, and manuscripts, signify either wood or the bark of a tree.

In Greek, $\beta\beta\lambda\omega\zeta$ is the inner bark of the papyrus. In Latin, "codex," meant a block of wood, "liber," the inner bark of a tree. The Teutonic races, without exception, use the term "book" for a collection of writings.

The history of this word is the history of Teutonic civilisation. For its origin we must go back far beyond the range of history to the period before the Aryan race had left their eastern father-land and separated into distinct tribes.

We find in Sanskrit the root, भक्ष् bhaksh, or भग् bhag, to eat. The Sanskrit roots, if roots at all, of which there can be

* All the terms above alluded to are very suggestive of one common origin, but unfortunately the Sanskrit root which would prove the converging point is wanting.

no doubt, are common to all the Aryan tongues, and must have existed from the origin of the race. From the abstract idea of eating, the simplest transition is to the thing eaten. We find in the Zend or ancient Persian, an Aryan tongue closely allied to the Sanskrit, the term bûk applied to the *Qnercus bellota*, a species of oak which produces edible fruit.

Turning to the Greek language, we find the same root in φάγ-ω to eat;* φηγ-ος *Quercus ægilops*, another species of oak. The same principle is found in

Lithuanian, buk-a.
Russian, buk-i.
Slavonic, buk;

all describing a tree with edible fruit. In Latin, "fag-us," the beech tree, supplies the place of the oak, the emigrants from the east naturally attaching the old names to the forms most similar. The

Irish, feagh-a.
Cambrian, faw-ydd;

both signify beech tree, and sufficiently indicate their connexion.

In the Teutonic tongues, we have—

Anglo-Saxon, boc.
Old High German, puoch.
Old Saxon, buk.
Holl. beuk-en.
Swedish, bok.

This is the first stage in the history of the word. "Bok" signifies beech-wood, which flourished in the indigenous forests of Europe, and from its smoothness and hardness, was well suited for engraving and carving.

We must now turn to the art of writing as it existed in the early ages of our Teutonic ancestors. Although for the most

* It must be explained that by the laws of phonetic change derived from a careful comparison of numerous instances, "bh." in Sanskrit, is represented by "φ," in Greek, "f," in Latin, and "b," in the Teutonic tongues.

part pre-historic, yet it has left sufficient evidence both in the terms of our language and in its actual remains, to enable us fully to understand its nature. All the modern European alphabets, it is scarcely necessary to mention, are derived from Asia through the Greek and Latin. Before their introduction, the Teutons were not unprovided with a system of letters which served, for all practical purposes, the requirements of those simple times. This was the Runic system of writing, which prevailed from an unknown antiquity, and was continued long after the Christian era.*

The word “runa,” in the Teutonic languages, originally signified a mystery, and is derived from the Sanskrit root रु ru, to mutter, to murmur. From the same source proceed the Latin “ru-mor,” “ru-gio,” “rau-cus,” and the Greek ῥ-ρύ-ομαι; so in Mat. ch. 4, v. 11—“The mysteries of the kingdom of God;” Gothic, “*runa* thiudangardjos Guths.” The writing consisted of characters cut on the sides and edges of small pieces of beech-wood. The novelty of the art imparted to it an air of mystery, which was kept up for the purpose of imposing on the ignorant, and imparting a solemn air to incantations and sorceries. The staffs so employed obtained the general name of “bok-stæf,” or “buch-stab;” they also received specific terms, according to the purposes for which the writing was employed, as “run-stæf,” when inscribed with magical characters; Old German, “ruog-stab,” an indictment or accusation, &c.†

Tacitus, judging doubtless from his own observation, states that the ancient Germans were ignorant of letters, “literarum secreta viri pariter ac fœminæ ignorant;” yet several passages

* Venantius Fortunatus, in the 7th century, writes—

“Barbara fraxineis pingatur rhuna tabellis.”

This shews that the ash was occasionally used as well as the “buch,” or beech, for writing on.

+ Many fine specimens are preserved in the Museum of Northern Antiquities, at Copenhagen.

in his treatise give indications of the existence of the Runic system, of the nature of which he was probably ignorant. He speaks of their veneration for “Aurinia,” which, doubtless, means the “Alruna,” or female sorcerers alluded to by Jornandes. He also mentions a mode of divination practised by the use of wooden slips with marks cut on the edges, which, after certain ceremonies, were thrown upon a white sheet, and afterwards taken up and interpreted according to the marks upon them. Nothing could more clearly indicate the original mode of Runic writing than this passage.

When the writing began to be sculptured on stone, the mode adopted of forming letters was that of cutting a representation of the upright staff which formed the letter I, and by cross lines representing the incisions marking the distinctions of the other letters.*

The term “buch-stab,” or “bok-staff,” thus became equivalent to the Latin “litera,” or letter, and is so used in all the Teutonic tongues. Even in English, we find it so employed in the 13th century—

“ And tatt he loke well thatt he
An *boc staff* write twiggess.”

Ormulum.

There were many systems of letters formed on this principle. They were termed “Futhorcs,” from the order in which the letters stood, f, u, th, &c., commencing the list, as a, b, c, do in the ordinary Roman or Phœnician alphabet.

At what period the Roman and Greek alphabets finally superseded the Runic in Western Europe, it is impossible to determine with certainty. In the 5th century, Chilperic, king of the Franks, revised the alphabet and added several letters, and the influence of the church finally secured the ascendancy of the Roman letters.

* “Hand dubie hæc est, quod omnes literæ Runicæ a primâ et elementari literâ I quæ manifestâ similitudine scipionem erectum representat, per similes baenlos vel annexos, vel transversos, partim obliquos partim incurvos oriuntur.” —Wachter, p. 1575.

In the Gothic language the case was somewhat different. We possess the terms "runa," for mystery, and "boka," and "bokas," for books and writings. Although there can be little doubt that the Runic system prevailed amongst the Goths as amongst the kindred races, yet the earlier introduction of alphabetical writing has obliterated the record of it. The term for writing in Gothic is "meljan," which comes from a root signifying to paint or blacken, equivalent to the Greek $\mu\varepsilon\lambda\alpha\epsilon$, black, $\mu\varepsilon\lambda\alpha\iota\omega$ to blacken; German, "malen;" Swedish "mala." We have the remains of this root in the term "maul-stick," used by the painter to steady his hand. Here there is an entire departure from the primitive idea connecting writing with cutting and engraving in all the other kindred tongues. It seems a fair inference that the term was first applied at the time when Ulphilas translated the Scriptures into the Gothic language, and constructed an alphabet for the purpose. The MS. being doubtless written on parchment, the old term no longer applied, and a word expressive of painting or colouring was more applicable.

The old bok-staf gave way to flat tablets of wood which were called "bokas," and to parchments called "bok-pells," and at length the term settled down in every Teutonic language to the modern "book," "buch," &c.*

The history of this word from its earliest traceable root, in Sanskrit, indicating the simplest animal wants, through its various applications down to its present use, is an epitome of the progress of the human race, and is, perhaps, as suggestive as any word in the English language of the essential identity of the great Aryan family.

* For the purposes of calendars, these "bok-stafs" were continued down to a late period. Borel, in the preface to his "Lexicon Vocab. Antiq. Gallicar," says, "Les paysans se servent encore d'une espèce de hieroglyphiques, en sorte qu'ils font des almanachs sur un morceau de bois, qui n'est pas si grand qu'une carte à jouer, où sont marqués tous les mois et jours de l'année, avec les fêtes et autres choses notables, par un artifice singulier."

We have a curious glimpse in the habits of our remote ancestors in the terms employed for reading. In the Gothic language, as anciently in the sister tongues, to read and to sing were expressed by the same verb “singvan.” Thus, in Luke, iv, 16, where our Lord entered into the synagogue, at Nazareth, and stood up to read, it is rendered “usstoth singvan bokos;” “he stood up to sing the writing.” Again in 1st Tim., iv. v. 13, “Till I come give attendance to reading,” &c., is rendered, unte qima gaumei sangva boko,” attend to the singing of books. The word “redan,” equivalent to our “read,” meant to think, to comprehend, to counsel. In fact, anciently, reading orally and singing were one and the same thing. Reading was a modulated recitation, and singing was merely recitative.* By the 8th century, the words “redan” and “singan” had settled down into their modern meaning. In the Anglo-Saxon version of the gospels, Luke, iv, v. 16, is rendered “he arás thøet he rœdde.”

I might proceed at much greater length. It would be interesting to show from the nomenclature of the most familiar ideas—the parts of the body—the relationships of life—the names of the heavenly bodies, and of the phenomena of nature, and by a large collection of verbs and adjectives predicative of actions, thoughts, feelings, and qualities, embracing a large proportion of those in daily use amongst us—that the Goths stood in very close relationship with our ancestors, but the limits of the present essay will not permit this. With one or two general observations I will bring my remarks to a close.

I have already alluded to the rudeness and imperfection of the Anglo-Saxon language at the earliest period known to us. The deficiency in the inflexions, and in their absence the

* In the services of religion, the musical intonation in reading has maintained its position to the present day. This appears to have been the case amongst the Jews in every age—‘*Judei ita pronunciant preces suas, ut potius canere quam precari eas diceres. Si dum recitant Textum, non prælegere, sed cantare eum videntur.*’—Grosgebauer, “*De Ceremoniis Judæorum.*”

want of suitable auxiliaries and particles to give precision to the meaning, indicate a transition state of degradation from its original inflexional character, without having acquired the compensation afforded by the modern grammatical system. In the Gothic version of the Scriptures, if this character appears at all, it is to a very small extent. The inflexional system, with the exception of the future and some other tenses of the verbs, is as complete as in the Latin, whilst the copiousness of the vocabulary gives great facilities in rendering the niceties of the Greek. The subtle reasonings and abrupt turns in the epistles of St. Paul; the noble bursts of eloquence which occasionally appear, are rendered in the Gothic with a faithfulness and force which are truly astonishing, and indicate a considerable amount of intellectual culture amongst the people speaking the language. Some passages in the Greek text, which depend for their effect on the use of the same word in different senses, have been found very difficult to render, with the proper point, into the modern European tongues. I would instance a passage in the Epistle to the Romans, chap. xii. v. 3, "For I say, through the grace given unto me, to every man that is among you, *not to think of himself more highly than he ought to think*, but to think soberly, according as God has dealt to every man the measure of faith." The original of the clause in Italies runs thus,— "*μη ὑπερφρονεῖν παρὸ δει φρονεῖν, ἀλλὰ φρονεῖν εἰς τὸ σωφρονεῖν;*" the point of the passage lying in the play on the word *φρονεῖν*, which in our translation is entirely lost. I have met with no translation, in any version, which equals the Gothic in reproducing the delicate shades of the original. It runs thus,— the verb "*frathjan*," to think, being equivalent to the Greek *φρονεῖν*,—"qitha auk thairli anst Guths, sei gibana ist mis, allaim visandaim in izvis *ni mais-frathjan than skuli-frathjan, ak frathjan du vaila-frathjan*," where the fanciful play of the words is literally reproduced.

There is, occasionally, a poetical grandeur attaching to the derivations and associations of the old Gothic words, which is very striking. Our words "sea" and "soul" are descended respectively from the Gothic "saiv" and "saivala," Anglo-Saxon "sae" and "savl," and there is little doubt of their being derived from a common root. The Latin "anima," and the Greek " $\psi \chi \eta$," mean simply "the breath," and are applied metaphorically to man's immortal part; but in the Gothic term a nobler image is presented. The soul is here the ocean of man's existence, like the sea, in its apparently limitless extent, with its storms and its calms; its sunshine and its gloom; its tides and its currents; and its ever restless, insatiable energy. The conception is bold and forcible, and indicates a deeply reflective turn amongst the people who could embody it in their language.

I have now brought to a close my remarks on the Gothic language. My object has been to shew the essential identity of our own mother tongue, traced through its ancient forms, with the earliest form of the Teutonic which remains to us in the Gothic version of the Scriptures; to prove so far as can be done in so small a compass, that all the modern Teutonic dialects may be traced to a common converging point, which lies very near the Gothic; to indicate from the structure and inflexions of this ancient tongue its analogies with the other members of the great Aryan family, and its points of divergence and departure from them.

I propose, on a future occasion, to enquire how far beyond the Gothic it is possible to trace the elements of our language, or, in other words, what connexion can be shewn to exist between the Teutonic dialects and the ancient Sanskrit roots.

FIFTH ORDINARY MEETING.

ROYAL INSTITUTION, December 15th, 1862.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

Thomas Balman, M.D., was balloted for, and elected a member.

The Rev. H. H. HIGGINS drew attention to a brilliant aurora which he had witnessed on the previous evening.

Dr. COLLINGWOOD exhibited specimens of a very remarkable coal found in the Albert Mine, Hillsborough, New Brunswick, of a very valuable character from the quantity of oil and gas which it contained. It was readily ignited by a candle, and burned with a steady flame, when removed. It has been sold at the pit's mouth at £3 per ton, for making refined petroleum oil, of which it yielded seventy gallons to the ton. It was now selling for ten dollars per ton for gas purposes. The mine was stated to be of a very remarkable geological character, and fish were occasionally found imbedded in the intermediate shales, of which one was exhibited.

Mr. MOORE exhibited a mounted skeleton of an adult male gorilla, from the Gaboon; presented to the Free Public Museum, by R. B. Walker, Esq., in May, 1862. The dimensions exceed those of any other gorilla skeleton yet recorded; the length of the principal bones being as follows:—

Humerus	17 $\frac{3}{4}$	Inches.
Ulna	14 $\frac{5}{8}$	"
Radius	14 $\frac{1}{4}$	"
Femur	16 $\frac{3}{8}$	"
Tibia	13 $\frac{1}{4}$	"
Fibula	11 $\frac{1}{4}$	"

The foregoing dimensions were taken with a rule having one fixed and one sliding arm at right angles to the rule, and consequently measuring the exact distance between the extreme points of each bone.

In the largest gorilla skeleton in the British Museum, an adult male from Paris, the humerus is 17 inches in length, and the femur, $14\frac{1}{2}$; and in Du Chaillu's "King of the Gorillas," in the same collection, the humerus measures $16\frac{1}{4}$, and the femur $13\frac{3}{4}$ inches.*

The PRESIDENT exhibited some new maps of New Zealand, and made some remarks upon the curious natural phenomena of a volcanic character, recently discovered by Dr. Hochstetter.

The SECRETARY then read a paper

"ON MODERN POETS AND THEIR POEMS."

By MR. E. J. REED,

Secretary to the Institute of Naval Architects.

* Vide "Annals and Magazine of Natural History," October, 1861, p. 350.

SIXTH ORDINARY MEETING.

ROYAL INSTITUTION, January 12th, 1863.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

Messrs. J. B. Cros, Ogden Bolton, and Rev. Enoch Mellor, were balloted for, and duly elected members.

The SECRETARY read the following account, by Mr. H. P. Horner, of the brilliant meteor of November 27th last, accompanied by drawings:—

“ Having had a tolerably good view of the brilliant meteor seen at 5 50 p.m., on Thursday, the 27th ultimo, I was led to make a sketch of it, as it seemed to me to bear in many points a strong resemblance to two others I had previously seen—one in the spring of 1835 or '36, and one at 0.57 a.m., on January 1st, 1858; while all three differed much from any others I have seen.

The meteor of the 27th November, 1862, I saw from the Toxteth-park road on my way from town, amid the gas and moonlight, through which, however, it shone brightly. Part of its course was hidden from me by buildings, but the extreme angular space within which, on the whole, I saw it, was about 40° from about S.E. by E. to nearly S. by E. Its elevation above the horizon I estimated at 8° , and its own apparent length 3° . This latter estimate I formed by comparison with the moon's diameter taken as $30'$, and making allowance for the deceptive effect as to size of any object in the sky seen near the horizon. The nucleus, which had so much of stellar radiance as to make its form rather indefinite to the eye, was a bright, bluish white-light, falling away in brilliancy as it merged in the body, passing through a greenish hue and then into yellow, and finally into red at the extremity. Its paler light, in the

line of the axis gave the idea of a hollow flame, and from the extremity of the tail, small portions, like red embers, seemed from time to time to be detached, immediately, however, vanishing, and leaving no visible track.

There appeared a constant flow backwards of flame or light from the head to the tail, and during the time it was concealed from my view, a momentary increase of the light it cast gave me the idea that a sudden blaze or coruscation had occurred; but when again in sight I could not observe any change in its appearance.

It had a slightly declining course, and passed through its own length, I should say, from three and a half to four times in a second. I did not see it disperse or "explode," as it has been said to have done, but lost sight of it in full course behind the neighbouring houses.

The meteor which I saw about 1835 or 1836 fell, apparently, vertically from the zenith to the western horizon about three o'clock, during a bright partial moonlight. It gave little or no impression of having forward or horizontal motion, and passed downward very rapidly, the red and rather ragged tail flickering or waving in its course.

The one seen by me on the morning of January 1st, 1858, appeared from behind clouds to the west, on a night when there was faint, partial moonlight, having, when first seen, an elevation of about 18° , or perhaps, 15° . It had a most imposing appearance from its passing successively behind three strata of cloud, and disappeared at last behind a bank of cloud which seemed to rest on the Carnarvonshire mountains. I found no record of it published, to my surprise, considering its splendour; but when crossing six months later between Dublin and Holyhead, I found, in conversation with an officer in the steamer, that he had seen it; and his description of its size and height when first seen led me to the conclusion that it had an elevation above the earth's surface of about 20

miles ; that it was distant from me about 110, and that its head or nucleus had a diameter of about half a mile. The meteor of the 27th ultimo was seen at Beeston, in Nottinghamshire, at a greater elevation than here, and in the neighbourhood of London,—with them also, having, as far as I can ascertain, a southerly direction.

If it had an apparent elevation there of, say 45° , and at Beeston, one of 11° , it would, according to my estimate of its apparent size, have a length of about twelve miles, a diameter of nucleus of $\frac{3}{4}$ mile, elevation above the earth's surface nearly forty miles, and a speed of about forty miles per second. In speaking of the probable diameter of the nucleus, I allude to the apparent star or blaze, not to the mass of any solid matter which might be present.

My belief is, that the three meteors named are of the same kind, but that the two earlier ones were seen fore-shortened ; and the sketches (since seen) published in the *Illustrated News* of December 6, showing the apparent form of the last at Beeston, confirm me in this opinion, as they closely resemble the shape of those I have described as seen in the years 1835 or 1836, and 1858. A comparison of the apparent length, as compared with the diameter, as seen from different points, might afford a means of ascertaining approximately the *horizontal* direction of the path.

All the three meteors I have described were similar in radiance, transition of colour, and general flame-like character. Though that of last month gave a greater idea of active incandescence than the others, all had the same faintness of light in the line of the axis behind the nucleus, and all passed without leaving any visible train or track, which, in the case of some meteors, as is well known, remains long after the body itself has vanished."

A discussion followed the reading of this communication, in which Dr. NEVINS alluded to the probability that the

meteor in question was one of a class which permanently circle round the sun, and becoming entangled occasionally in the earth's atmosphere, become by degrees burnt up, after successive revolutions.

A paper was then read of which the following is an abstract :—

RIGHT AND WRONG.

By ANDREW COMMINES, LL.D.

THE author reviewed the different causes which produced different conceptions of the same abstract idea in different minds. It is the business of science to remove this confusion by fixing the meaning of the terms which express such abstractions ; and thus to lay the foundation of investigation, and render reasoning profitable. The moral sciences are far behind the physical in this respect, and the very words "right and wrong," upon which the whole superstructure is built, are still as loosely used as they were in the times of Socrates and Plato. In trying to fix the meaning of an abstract term, the best guide is the original application of it. *Right*, in the primary sense, meant *straight*, direct ; and *wrong*, *crooked*, or indirect. The derivation is the same in nearly all the European languages, both ancient and modern. When men felt the necessity of expressing what was in conformity with rule or command, they used the sensible image of *ruled* or *straight*, and called it figuratively by the same name, *right* ; and when they would express the opposite, they called it *crooked* or *wrong*.

The simple idea of right, therefore, being what is in conformity with some rule or law, and of wrong, that which did not conform to some rules or laws, the first step in the investi-

gation is to determine what are the rules or laws, conformity or discordance with which constitutes right or wrong. He then reviewed the different schools which have endeavoured to ascertain and lay down those laws—the theologians, the moralists, the philosophers, and the lawyers—and shewed the distinction between the law of compulsory action, or positive law, which is the foundation of legal right, and the law of voluntary action, or moral law, which is the rule of moral right. The ultimate basis of positive right is the supreme power of a state; but what is the ultimate basis of moral right? Seven different solutions have been given to this question, every one of them supported by the authority of great names. These contending philosophers divided into two great parties, one of which (the moral sense school), including the Stoics, amongst the ancients, and Butler, Grotius, Thomasius, Clarke, Smith, Mackintosh, and Kent, amongst the moderns, who assert that the test of right is conformity to the dictates of conscience, or the moral sense; and another (the utilitarian school), to which belonged the Epicureans of old, and Hobbes, Hume, Bentham, and Paley, amongst the moderns, who deny the existence of a moral sense, and make general utility the test of right. The author reviewed the arguments used by the upholders of each system, and particularly the objections urged by the utilitarians against their opponents, that the dictates of conscience are not uniform, and that it has no rule to guide it. He laid down the rule of guidance as one that is as universal as the human race, and has been inculcated from the time of Confucius to the present day—the simple Christian principle, to do to others as you would wish they would do to you. The author then considered "right," in conjunction with the correlative "duty," observing that one cannot be understood without considering the other, shewing how many evils, both moral, social, and political, arise from an exclusive consi-

deration of either of them. He then concluded by pointing out the mischief which arises from the confusion of rights of different kinds—legal, moral, political, &c., and from having incompatible rights vested in the same individual.

SEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, January 26th, 1863.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

The following gentlemen were balloted for, and duly elected members of the Society :—

Dr. J. de Boehm,
Mr. Richard Johnson, jun.,
Rev. W. C. Green, M.A.,
Andrew Commins, LL.D.,
Mr. J. Abbot, B.A., and
Mr. G. Whitelaw, T. C. D.

The following paper was then read :—

ON

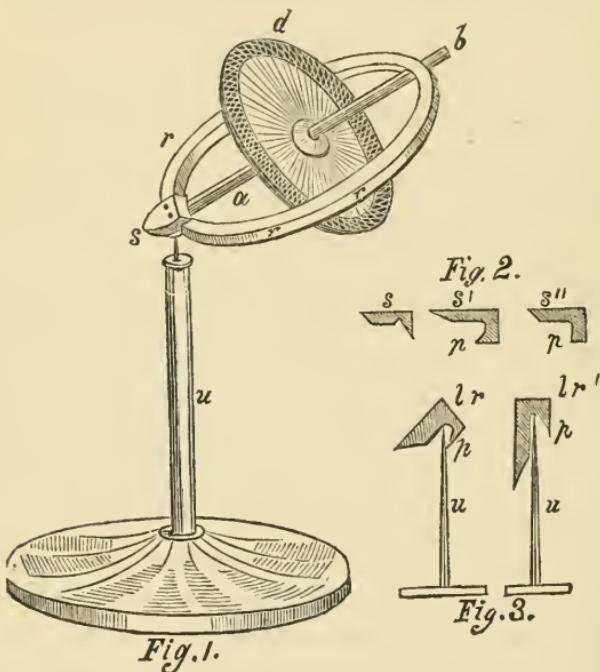
SOME NEW AND HITHERTO UNEXPLAINED
PHENOMENA EXHIBITED BY THE
GYROSCOPE.

By J. BIRKBECK NEVINS, M.D. Lond., V.P.

THE experiments which will form the special subject of the evening, are exhibited by means of a Gyroscope, constructed by Mr. J. W. Wood, of Church-street, Liverpool. He has noticed in this instrument the unusual circumstance that as the rotation of the brass disk slackens in speed, the whole apparatus, *i.e.*, the disk and its supporting ring, instead of beginning to fall, as is usually the case, assumes a gradually more and more erect position, until at length, it has attained a perfectly vertical direction. In this position it revolves upon the summit of the point of support, until the rotation of the disk having ceased it falls to the ground, as in the case of any other body supported merely upon a point. Mr. Wood has constructed two other instruments which act in the same way ; though the difficulty of making them has been such, that he has experienced many failures in each case before he has succeeded in making the apparatus act in this manner. The explanation of the phenomenon, when successful, and the causes of failure in making the apparatus, have not been explained by his friends to whom he has shewn them, and he has, therefore, brought them under my notice.

The first point, clearly, was to be satisfied of the certainty and uniformity of the results above described ; and I have repeated the experiments so frequently that there can be no doubt upon that subject. It appeared to me that a result so

opposite to the usual one must be connected with some peculiarity in the construction of the apparatus, which had, perhaps, been unobserved or thought of no consequence; and this conjecture was strengthened by the circumstance of the repeated failure in making other instruments.



The accompanying drawing, figure 1, exhibits the general appearance of the apparatus, and the method of trying the experiment. It is necessary for its success that the rotating portion of the instrument should be placed on the summit of its support, *u*, at an angle of about 45° . If it is placed in a horizontal position to begin with it does not rise, but simply revolves round the point of support until its speed slackens, when it begins to fall, like any other gyroscope. But if it is placed in the position shewn in the drawing whilst the rotation of the disk, *d*, is very rapid, it gradually becomes more and more erect as its speed diminishes, until at length

the axis, a b, is in the same straight line with the upright support, u ; and it spins vertically on the edge of the ring, r, r, r, with the disk, d, in a horizontal direction. The explanation of the experiment appears to me to depend upon the peculiar form of the portion of the ring marked, s, fig. 1, which is placed upon the point at the summit of u, the supporting stand. Instead of being a mere vertical notch, as shewn in s, figure 2, the workman had tooled out with a gouge a sort of cup-shaped cavity, shewn in s', figure 2, without apparently attaching much importance to the circumstance. When, however, the apparatus is put into the proper position, viz., at the angle of about 45° , it is evident that the edge, p, figure 3, of this cup presses against the upright, u ; and that there will be friction at this point when the gyroscope revolves round its centre of support.

In consequence of this pressure and friction the upright, u, will have a tendency to be pushed away from p, and if it was free to move it would doubtless recede from p ; but since it is fixed upon the table, and therefore cannot move, the body which is able to move will do so, and p will have a tendency to recede from u. But if any motion occurs it will be in the direction of least resistance : and it is evident that the summit of u has the least resistance to motion in the direction l, r, that is, towards the cup-shaped cavity : the consequence is that p recedes from u, and the cup-shaped cavity slips over the point of u, until it assumes the position l', r', fig. 3 : that is to say, until the ring of the apparatus r, r, r, fig. 1 is vertically upon the summit of u.

In order to be satisfied that there really is such pressure and friction at p as is here mentioned, I blackened by a smoking taper the interior and edge of the cup-shaped cavity ; and the first experiment tried afterwards removed the soot, and shewed the polished brass underneath at the point p, where the friction was produced.

The apparatus, fig. 1, and s' , fig. 2, represent the instruments first shewn to me by Mr. Wood, which succeeded perfectly in every case ; and he afterwards made an instrument for me which failed to rise in every experiment. On examining the portion s of the new apparatus, the cause of failure appeared to me to be evident. The drawing s'' , fig. 2, represents the socket of that instrument, and if the explanation given above is the correct one, it will be evident that only failure could be looked for from such a socket ; for p in that socket could never press against u so as to produce the pressure required ; and there is no direction of little resistance similar to that in l , r , fig. 3. When this was pointed out, a cavity was gouged out similar to that in s' , fig. 2, and now the experiment succeeds whenever it is tried.

The effect of rapid rotation in producing stability, as in a common top and in the ordinary gyroscope, is well known ; and in accordance with this it is not until the rotation slackens that the instrument perceptibly rises, and if the points of support are carefully oiled, and friction reduced as much as possible, so that the rotation may be very rapid, it is sometimes four or five minutes before it has risen to the vertical position. It appeared to me probable that if the rotation could be rapidly retarded during the course of the experiment it ought to rise more speedily ; but the difficulty was to find a means of retarding the rotation, without at the same time exerting a pressure upon the instrument itself, either downwards or sideways, which would introduce a fallacy into the experiment. The object was, however, accomplished by means of a common thin visiting card, which was made to touch the upper edge of the disk, d , fig. 1. Whilst it was rotating very rapidly, the card was too thin and flexible to exert any downward pressure, though it evidently retarded the speed of the rotation ; and now the instrument rose rapidly and most sensibly to the eye, and gained its vertical position in much less than half the usual time.

After the experiments above described had been shewn, and illustrated in various ways, the usual experiments with the ordinary gyroscope were exhibited and explained; but this portion of the subject is fully detailed in Professor Hamilton's paper on the gyroscope in vol. xii, 1857-58, of the Transactions of the Literary and Philosophical Society. In the discussion which ensued, several members took a part; and one question asked by Alderman Bennett is here specially introduced, because of the interest which it excited, and because the answer to it has not yet been ascertained. In the ordinary gyroscope, fig. 4, it is well known that if the disk, d, is

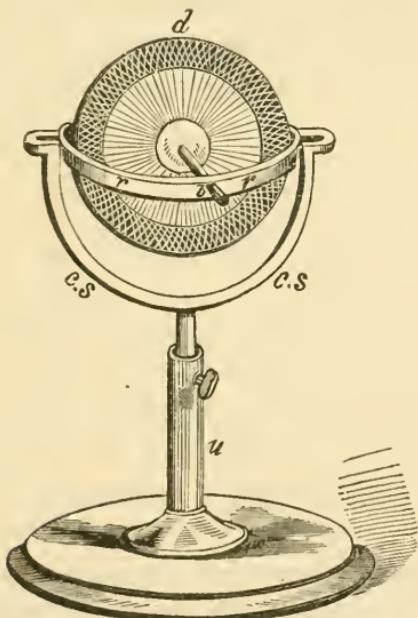


Fig. 4.

rotating rapidly, considerable force is requisite to make the ring r, r , turn upon its gimbals, so as to move the disk from its vertical direction; and it is also well known that if a weight is attached to the extremity of the axis, b, instead of overbalancing the apparatus towards that side, the effect of the weight is to make it revolve upon its support, u, the disk, d,

still retaining its vertical direction as long as the speed of rotation is rapid ; as soon as this slackens, then the weight begins to produce its ordinary effect, and the apparatus is overbalanced and falls to that side. These phenomena and their explanation are sufficiently known ; but Mr. Bennett shewed that if the semi-circular support, *c s*, was firmly held by the two hands so as to prevent any motion in it, then the smallest weight on the end of the axis, *b*, makes the instrument fall over : and the slightest tap upon the ring, *r*, *r*, will produce the same effect, whilst a heavy blow upon the ring is powerless to move it, the moment the hands are removed from *c s*, and the instrument is left by itself. Dr. Nevins was not able to give any explanation ; and the experiment is here mentioned, in hopes of eliciting one from some of our readers.

EIGHTH ORDINARY MEETING.

ROYAL INSTITUTION, February 9th, 1863.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

The following members were balloted for and duly elected members of the Society :—Mr. Lionel Ronald, Rev. E. Giles (Huyton), Rev. Nevison Loraine, Mr. William Finlay (Collegiate Institution), Mr. E. Lister, L.R.C.P.E., Mr. J. W. Wood, and Mr. T. A. Hart, M.A.

The following gentlemen were balloted for and elected Associates, on the recommendation of the Council :—Captain J. P. Anderson (Cunard service), Captain John Carr, and Captain Charles E. Pryce.

The Rev. H. H. HIGGINS exhibited and described some interesting Bryozoa of the genera *Catecinella* and *Emma*, found upon roots of seaweeds sent from Hobson's Bay.

Mr. JAMES YATES, F.R.S., hon. member, and vice-president of the International Decimal Association, announced the progress made by the Association towards a metrical system of weights and measures. A system had been recommended by a committee, who congratulate the nation on the fair prospect of a satisfactory and permanent settlement of the question. They proposed that the use of the metric system should be legalised, but without compulsion until sanctioned by the general conviction of the public,—in fact, that it should be publicly sanctioned on all occasions, as well as taught in schools receiving government support.

Dr. IHNE drew attention to an old English word, still extant and in constant use in the north of the island, but totally lost from the literary English. There is no word to express the opposite of *to grudge*, the German *goennen*, but the old genuine Saxon verb *to thoile*, or *thole*, commonly used in Yorkshire in such phrases as “I thoile thee thy pipe.” From the same root are the Gothic *thulan*, the Old Saxon *tholōn*, Anglo-Saxon *tholian*, the Norse *thola*, the old High German *doljan*, the modern German *dulden*, and even the Latin *tolero*, and *tollo*, and the Greek *ταλάω* (*talao*). The primary meaning is *to bear*, and from it is formed *thole*, the piece of wood supporting the oar, as well as *thole-pin*. Dr. Ihne expressed his regret that such good, genuine Saxon words, which still lived in the mouth of the people, should be allowed to disappear from the vocabulary, whilst numbers of new words were constantly imported from French and Latin which were ill suited to supply their place.

The following paper was then read :—

NOTES ON ENGLISH GRAMMAR.

By WILLIAM IHNE, PH.D., PRESIDENT.

THE FUTURE TENSE.

No Teutonic language has a simple Future Tense, formed by inflexion from the stem of the verb, like the Future of the Greek, the Latin, and the Romance languages. "There is," says Archdeacon Hare (*Philological Museum*, vol. ii, p. 218), "an awful, irrepressible, and almost instinctive consciousness of the uncertainty of the Future, and of our own powerlessness over it, which in all cultivated languages has silently and imperceptibly modified the mode of expression with regard to it." Whether this feeling of awe is the real cause of the original want of a Future Tense in certain languages, I do not venture to decide. In Hebrew and Welsh, at any rate, such a feeling could not operate; for there we have a Future, and we lack that Tense which seems the most real of all, viz., the Present. The conception of Futurity cannot be avoided by the rudest of men, and the want of an adequate expression of it is nothing but a defect, which, in the advancing culture of a language, cannot fail to be perceived and to be rectified.

The English language has now a composite Future which may be said to answer all practical purposes. It is formed by the Infinitive of the verb, and one or the other of the two verbs *shall* and *will* used as auxiliaries. In principal affirmative sentences, *shall* is used in the first person, both singular and plural, and *will* with the second and third persons, as—

I shall sail, thou wilt sail, he will sail.

We shall sail, ye will sail, they will sail.

In interrogative sentences, *shall* is used for the first and second persons,* and *will* only for the third, as—

Shall I sail? shalt thou sail? will he sail?
Shall we sail? shall ye sail? will they sail?

In secondary sentences, the use of *shall* and *will* is not quite so clear; at least, in the second and third persons, *shall* and *will* are both used, and sometimes indifferently, as—

(If, that, because, &c.) I shall sail, thou shalt or wilt sail, he shall or will sail.

We shall sail, ye shall or will sail, they shall or will sail.

The reason why, in secondary sentences, there is some uncertainty in the use of *shall* and *will* is partly to be found in the fact, that in such sentences we very generally avoid employing the Future Tense, and use the Present instead. For instance—If you shall sail to-morrow, I shall not see you again. This is quite correct, but we almost invariably say—If you sail to-morrow, I shall not see you again. The verb of the principal sentence is sufficient to extend the conception of Futurity to the secondary verb, which, consequently, can be left in the simple form of the present. Now, as compound Tenses are always clumsy and heavy, we avail ourselves whenever we can of the opportunity of using the Present in secondary sentences, and hence, the feeling which imperatively decides in other sentences between *shall* and *will*, could not grow to sufficient strength in the case of secondary sentences, and form a clear law of language.†

* In the second person there is by no means a perfect agreement. Many use *will* invariably, and cannot be made to see the difference between volition and simple Futurity, which indeed, in some cases, are hardly distinguishable. W. Rushton, Professor of English at Cork (Queen's University), gives (in a private communication) the Interrogative Future as, *wilt thou, will you*, which, he says, simply ask for information. It is true, he gives *shalt thou, shall you* also, but seems to make no distinction between the use of *shall* and *will* in the second person of the interrogative verb.

† In the conditional future *should* and *would* are employed as follows—1st. In principal sentences, *I should, thou wouldest, he would*, &c. 2nd. In interrogative sentences, *Should I, wouldest thou, would he?* 3rd. In secondary sentences, *If I should, if thou shouldst, if he should*.

I have said that the English Future answers all practical purposes. By saying that, I do not mean, however, that it is perfect. In the first place, a compound Tense is lumbering, slow, and weak, compared with one formed by internal organic change of the root or by termination. “*Dedissem*” is a more forcible expression than “I should have given ;” but this inferiority of the English Future, compared with the Latin or French, is of comparatively little moment. We get accustomed to look upon compound tenses, and to pronounce them, almost as if they were simple ; so that often the difference is more a matter of spelling than formation.* But a material objection to the English Future lies in this, that the verbs *shall* and *will* have not entirely lost their original signification, and that, therefore, in many instances, the idea of simple Futurity is troubled and obscured by the admixture of the idea of volition or compulsion. This could easily be avoided if we agreed to restrict *shall* and *will* to their auxiliary functions in the formation of the Future, and to employ other verbs, of which we have ample choice, to express volition or compulsion. But though the tendency of the language seems to be in that direction, this has not been done yet, and we have consequently to put up with a certain degree of indistinctness in the English Future.

In the first person, in affirmative sentences (principal or secondary), there is no doubt whatever, that *shall* means Futurity alone. It has stripped off all idea of obligation and necessity. If we wish to express this (the German *ich soll*) we say, “I am to sail, we have to work, I must, ought, am obliged,” &c. ; but never “I or we shall.” In interrogative sentences, however, there is uncertainty. “Shall I die, doctor?” asks the desponding patient. He means simple Futurity. “Shall I die for you ?” exclaims the despairing lover on his

* The French Future is compounded with the infinitive, and the verb *avoir*, only the French do not spell *je parler ai, tu parler as, il parler a, but je parlerai, tu parleras, il parlera.*

knees. "Shall I bring up the pudding?" says the servant. Here simple Futurity is out of the question; it is order and compulsion that are implied. The Scotch, evidently, here have the advantage over the English. They use *will* to express the future, and *shall* to express obligation—"Will I die, doctor; will I have any more pain?" and on the other hand, "Shall I knock his head off?"

In the second person the simple Future is expressed in affirmative principal sentences by *will*, and in interrogative sentences by *shall*, as, *you will sail*; *shall you sail?* If we say, *you shall sail*, we express an order, and if we say, *will you sail?* we mean to ask if there is an intention, at least, if we are very accurate and precise in our expression. But I have observed that a great many writers and speakers are in the habit of using *will you*, where *shall you* is more correct, *viz.*, where no volition is implied.

To express volition in affirmative sentences, we either use some other verb, such as *intend*, *wish*, or we lay a stress on *will*, as, "In spite of warning, you *will* continue your evil practices." This stress is a sufficient distinction. If it is not apparent in writing or printing it is the fault of our imperfect orthography. If we wish to express obligation interrogatively (the German *sollst du*), we never say, *shall you?* but we take the same verbs as in the first person, *are you to sail?* *have you to work?* *must, ought you, are you obliged?* &c.

In secondary sentences, as we have remarked above, there is some degree of indefiniteness in the use of *shall* and *will*. Sir E. Head says (*shall and will*, p. 2)—"The practice with the second person in oblique sentences does not seem quite clear." The tendency now is, I believe, to say *will*, in all cases, or to use the Present Tense. The Prayer Book has—"We believe that thou *shalt* come." The more current expression now would be—"We believe that thou *wilt* come." "We hope you *will* recover," is said by everybody. Nobody thinks

of saying—"We hope you *shall* recover." Sir E. Head considers the following two sentences equally correct—"You think you shall do it," and "you think you will do it." Granted that they are equally correct, I believe nine persons out of ten say *will*; and certainly *shall* will not do, unless the subject of the principal sentence is *you*. We cannot say—I, or we think you *shall* do it. It must be—I think you *will* do it. The use of *shall* in such secondary sentences, which have the same subject as the principal sentence, is a notable peculiarity, and will be adverted to again, when we speak of the third person. It is a remnant of antiquity, and seems destined to be swept away soon.

"If you shall insist, I will obey," is certainly correct; but again, I believe that most people would prefer saying—"If you insist, I will obey," because, as I remarked before, in a secondary sentence the simple present is preferred. The use of *should* and *would* in secondary sentences is by no means very clearly established, and often depends upon an indescribable and indefinable feeling of their relative appropriateness. "You said you should be in town on Saturday," is quite correct, but so is, "You said you would be in town on Saturday;" and it is imperative to use *would*, if the subject of the principal sentence is altered. Again, "you thought you *would* die," and "you said you *should* die." What is the difference? I believe that in all these cases *will* and *would* are striving for mastery with *shall* and *should*, and that the tendency of the language is to favor the former.

We come now to speak of the third person in the three different kinds of sentences, affirmative, interrogative, and secondary. Here we find *will* and *would* established throughout, except in certain kinds of dependent clauses. We say, *he will sail, will he sail? the ship that will sail to-morrow.*

As in the second person, we can, by laying a stress on *will*, convert the auxiliary into a verb implying volition. "He

will blunder, though I caution him ever so much." " *Will* you be attentive to your work ? " " A man that *will* make a fool of himself deserves no pity." The emphasis is enough to mark the difference in the meaning of *will*, and if it were felt to be desirable, this difference could easily be indicated in writing.

In some secondary clauses *shall* is substituted for *will*, viz., when the subject of the secondary clause is the same as that of the principal, *e.g.*, " the captain thinks he *shall* sail to-morrow." Here *he*, the subject of the second sentence, is identical with *captain*, the subject of the first. If we substitute some other subject in the first clause, the *shall* of the second becomes *will*, *e.g.*, " My brother thinks the captain *will* sail to-morrow." Moreover, in some adverbial sentences *shall* and *should* are necessary. " Whenever (or *if, provided*) it *shall* happen that, &c. If it *should* be found out." This seems to be owing to the hypothetical nature of these sentences. We should use *will* and *would* in other adverbial clauses, as, " Because he *will* be found out ; because he *would* fail. I can tell you when he *will* arrive. We did not know when he *would* arrive. He labours so diligently that he *will* be sure to succeed."

Upon the whole, then, as we have seen, there is no great practical difficulty in distinguishing between the cases where *shall* and those where *will* is required. The difficulty is confined to those instances where either one or the other may be used, and where only grammatical over-refinement can establish a fundamental difference, or where the Present Tense is commonly used for the Future.* It is curious that many

* In the town of Liverpool, the correct use of *shall* and *will* is, however, by no means universal even in the case of persons born and bred here. This is probably caused by the considerable number of Scotch and Irish residents. I have particularly observed that mistakes are common and difficult to eradicate in the children of Scotch and Irish families. But even professional men, though of English descent and education, have occasionally their feeling of grammatical accuracy blunted by the intercourse with persons who speak incorrectly.

Latin grammars retained till lately, or still retain, the practice of rendering the Latin Future in all persons by *shall* and *will*. For instance, the Eton Latin Grammar (edition, 1838) has

Audiam, I shall or will hear.
Audies, thou shalt or will hear.
Audiet, he shall or will hear.

The edition of 1861 has, *I shall hear, thou wilt, he will hear*. When the alteration was made I cannot now ascertain. How is it, then, that only in England proper the use of *shall* and *will* is thoroughly understood and practised without error? The Scotch, the Irish, and to a great extent, also, the Americans, constantly use *will* in the first person, where we use *shall*, as—"I will be obliged to you, if you lend me £5." "Will I die, docto[r]?" "Will I have any more pain?" &c.

Everybody knows the jocular taunt thrown at our northern and western neighbours. It is stated that they would say—"I will be drowned and nobody shall save me." I am assured by my Scottish friends that the second part of this phrase is not good Scotch, and that they would use *will* and not *shall*. They invariably use *will* to express Futurity, and *shall* to express obligation, and for this they are ridiculed by all patriotic Englishmen, and they are pronounced to be actually backward in civilisation and good breeding. Archdeacon Hare says (Phil. Mus. ii, 218)—"Our Future, or at least what answers to it, is *I shall, thou wilt, he will*. When speaking in the first person, we speak submissively; when speaking to or of another, we speak courteously. In our older writers, for instance in our translation of the Bible, shall is applied to all three persons; we had not then reached that stage of politeness which shrinks from the appearance even of speaking compulsorily of another. On the other hand, the Scotch use *will* in the first person; that is, as a nation, they have not acquired that particular shade of good breeding which shrinks from thrusting itself forward."

Now, this is rather a serious charge. The bulk of the Scotch, in the middle of the nineteenth century, and even some of their most eminent writers are here supposed not to be so far advanced in general good breeding and politeness as the English were more than 300 years ago, and that in spite of the good example that has been set them for such a long time. They have not only been unable to find out for themselves how they ought to speak politely, "without thrusting themselves forward," but, when they have been told, they have not the sense to see it, and they *will* persist to be rude.

I confess I can hardly treat such an argument seriously. I fail to perceive the politeness of a man who says, "I shall be obliged, if you lend me £5," or the rudeness of another who says, "I will be obliged." The *shall* and *will* have nothing whatever to do with politeness or the want of politeness. It is not in these words, but in what accompanies them that we can show our good breeding. Grammatical forms are quite independent of such considerations.

The fact is, the Scotch went one way in forming the modern Future, the English went another. If Scotland had been the seat of government; of the court; of the capital of Great Britain, we should have adopted the northern practice, as now we follow the southern. In itself the one is as good as the other; but, as England has acquired the lion's share in grammatical as well as political legislation, the Scotch must simply bow to the majority, and add another to the long list of grievances under which they suffer.

The English Future, in Wyclif's time, was formed exclusively by *shall*. It is quite possible to show a few faint traces of the introduction of *will* in Chaucer, and, perhaps, some other writers of the time. But in Wyclif's Bible I can discover only *shall*. Now, this was found to be, in some instances, very inconvenient, as *shall* retained its meaning of obligation, besides serving to form the future. I believe that

the inconvenience began to be felt when popular preaching in the vernacular became more common. The preachers had necessarily to deal largely in religious and moral injunctions. "Thou shalt not steal; thou shalt not commit adultery." As long as such commandments could be interpreted as Future tenses, the preachers would fail to produce the desired effect. They had, therefore, either to substitute another word to convey the idea of obligation, or the future had to be expressed by some other auxiliary. If the old Saxon word *weorthan* had been preserved, and used like the German *werden*, to express the future, the problem would have been solved in a most satisfactory way, as it was in German.

But, unfortunately, *will* was employed, and now the Scotch went to work in a more systematic way, and used *will* throughout. The English, faithful to their national character, did not care about regularity and symmetry. As in everything else, they made a compromise between the old and the new. They preserved the *shall* in the first person, because the notion of commanding one's self could not be entertained, just as the imperative mood has no first person. In the second and third person they substituted *will*. In questions the *shall* was even serviceable in the second person, because if a question is asked, it cannot be mistaken for a command. In secondary sentences the *shall* was not so much restricted by the *will*, because the comparatively rare use of the Future in secondary sentences did not work out a decided general feeling and unanimity. On the whole, the words *shall* and *will*, *should* and *would*, retained more of their primitive meaning in these secondary sentences; but now, in the time of grammarians, who lay down positive rules, it is not unlikely that we shall see the secondary sentences more and more brought under the same law as the principal sentences.

It is interesting to watch the gradual introduction of the modern future. It can be most satisfactorily traced in the

successive translations of the Bible. Wyclif, as I have already stated, invariably uses *shall*, but none of the succeeding translators follow his example. Whenever the Greek Future can be conceived to contain the idea of volition, they more or less use *will*, even in the first person;* but they are by no means agreed among themselves, and often the same translator seems to waver in the use of the two auxiliaries. It will be interesting to adduce a few examples.

The Prayer Book translation of Psalm xviii., v. 25, runs thus :

“ 25. With the holy thou *shalt* be holy: and with a perfect man thou *shalt* be perfect. 26. With the clean thou *shalt* be clean: and with the froward thou *shalt* learn frowardness. 27. For thou *shalt* save the people that are in adversity: and *shalt* bring down the high looks of the proud. 28. Thou also *shalt* light my candle: the Lord my God *shall* make my darkness to be light.”

The authorized version has,

“ 25. With the merciful thou *wilt* show thyself merciful: with an upright man thou *wilt* show thyself upright. 26. With the pure thou *wilt* show thyself pure: and with the froward thou *wilt* show thyself froward. 27. For thou *wilt* save the afflicted people: but *wilt* bring down high looks. 28. For thou *wilt* light my candle: the Lord, my God, *will* enlighten my darkness.”

Here is a complete change in less than half a century, (from 1568 to 1611.) But it appears the translator of the Prayer Book lagged rather behind his time, as will be seen from a comparison of Tyndale's (1535), Cranmer's (1539), the Geneva

* For instance, Matt. iv. 9, Wyclif translates, “ All these I shall give ($\delta\omega\sigma\omega$) to thee.” All the other translators have “ I will give,” which is more an interpretation than a translation of the original. Matt. vi. 21. “ For where your treasure is, there will your heart be ($\xi\sigma\tau\alpha\iota$) also.” No translator here has *shall*. Wyclif uses the present tense *is*. Possibly he intentionally avoided *shall*, as it might have conveyed the notion of command. So also the Rheims version. The other translators have *will*, by which, very appropriately, the idea was imparted to the text, that the heart *inclines* to be with its treasure. No such reasoning, however, prevented the use of *shall* in the following verse, (22.) “ The light of the body is the eye: if, therefore, thine eye be single, thy whole body *shall* be full of light.” Here all translators have *shall*.

On the other hand, the Greek Future was rendered sometimes by *shall* on purpose to convey the idea of obligation, as $\mu\epsilon\pi\mu\eta\sigma\epsilon\iota$, (Luther, *wird-sorgen*,) in Matt. vi. 31. “ The morrow *shall* take thought for the things of itself.” Tyndale goes even further, and says, “ Let the morrow care for itself;” which is going beyond the province of a translator.

Bible (1557), and the Rheims Bible (1582). I quote from the authorized version, Matthew iii., 11 :

“ But he that *cometh* (1) after me, is mightier than I, whose shoes I am not worthy to bear; he *shall* (2) baptize ($\betaαπτίσει$) you with the Holy Ghost and with fire. Whose fan is in his hand, and he *will* (3) thoroughly purge ($\hat{\epsilon}ιακαθαρεῖ$) his floor, and gather (4) ($\sigmaντάξει$) his wheat into the garner; but *will* (5) burn up ($\kappaατακαύσει$) the chaff with unquenchable fire.”

Wyclif, of course, renders all the Greek futures by *shall*. Tyndale has *shall* only once, viz., he *shall* (2) baptize (like the authorized version). Cranmer has *shall* twice, viz., *shall* (2) come, and *shall* (2) baptize. The Geneva Bible, agreeing with Tyndale, has *shall* once, viz., he *shall* (2) baptize. The Rheims Bible has *shall* three times, viz., *shall* (1) come, *shall* (2) baptize, *shall* (3) clean purge, and *will* twice, viz., *will* (4) gather, *will* (5) burn.

Here we can distinctly discover a state of transition, and unsettled usage. The authorized version itself is here, as elsewhere, at variance with itself; for instance, Psalm v. 6,

“ Thou *shalt* destroy them that speak leasing: the Lord *will* abhor the bloody and deceitful man.”

Here we see the Future in the second person, expressed by *shall*; but in the same Psalm, v. 12, it is rendered by *will*:

“ For thou, Lord, *wilt* bless the righteous; with favour *wilt* thou compass him as with a shield.”

Curiously enough, the Prayer Book agrees with the authorized version, thus showing that, in 1568, the interregnum, if I can call it so, had already begun. Matt. vi. 4:—

“ And thy Father, which seeth in secret, himself *shall* reward thee openly.”

This is evidently the simple Future, and ought to have been translated by *will* reward; but the Rheims translation alone has “ *will* repay thee.” Matt. vi. 14:—

“ For if ye *forgive* (1) men their trespasses, your Heavenly Father *will* (2) also forgive you; but if ye forgive (3) not men their trespasses, neither *will* (4) your Father forgive your trespasses.”

We have here four verbs, (1) if ye forgive; (2) he will for-

give ; (3) if ye forgive not ; (4) neither will he forgive. It is curious to see how these four verbs have been handled by the different translators.

Wiclid has the present tense in (1) and (3), like the authorized version ; but *shall* in (2) and (4). Tyndale has *shall*, in (1) (2) and (4) ; *will*, in (3.) Cranmer has the present tense in (1) ; *shall*, in (2) and (4) ; *will*, in (3.) The Geneva Bible agrees with the authorized version. The Rheims Bible has *will* in all the four cases.

If we carefully compare this passage with Matt. iii. 11, quoted above, we see that the translators had no fixed rule, or even predilection in the use of *shall* and *will*. For instance, whereas, in the former, Tyndale and Cranmer favor *will*, in the latter they favor *shall*, and the Rheims translation does just the reverse.

It is unnecessary to produce more evidence to prove that, in the age of the Reformation, the present form of the Future was not yet elaborated, and acknowledged by the several translators of the Scriptures. Other writers are equally at variance with the modern use. Ascham writes—

“ The scholar *shall* win nothing by paraphrases.”

Hooker says—

“ No; I *will* not be afraid to say unto a Pope or Cardinal, in this plight.”

This is clearly Scotch. We find this even in Shakspere. For instance, in the Merchant of Venice, I. 3—

Bassanio—“ You shall not seal to such a bond for me.”

Antonio—“ Why, fear not, man, I *will* not forfeit it.”

It would be absurd for Antonio emphatically to deny that he *intended* forfeiting the bond. He means to say, that the contingency which could make him forfeit it, is not at all likely to arise.

Merchant of Venice, II. 3. Jessica says to Launcelot, who is going to wait upon his new master—

“ And, Launcelot, soon at supper *shalt* thou see Lorenzo.”

Measure for Measure, iv, 1. "May be *I will* call upon you anon."

Merry Wives, iii, 3. "I'll warrant *we'll* unkennel the fox."

Merry Wives, i, 1. "I am of the church, and *will be* glad to do my benevolence to make atonements and compromises between you."

Merry Wives, i, 1. "I hope, sir, *I will do*, as it shall become one that it would do reason."

Merry Wives, i, 3. "It is a life that I have desired; *I will* thrive."

Merry Wives, i, 3. "We *will* thrive, lads, we *will* thrive."

Merry Wives, ii, 2. "See the hell of having a false woman! my bed *shall* be abused, my coffers ransacked."

Measure for Measure, iii, 1. "Be absolute for death; either death or life *shall* thereby be the sweeter."

King Kenry VI, 1st pt., i, 1. "Henry is dead and never *shall* revive."

Merchant of Venice, iii, 2. "Look on beauty, and you *shall* see it is purchased by the weight."

Ibid., iii, 1. "Our feast *shall* be much honoured in your marriage."

Ibid., iv, 1. "I'll take no more;

And you in love *shall* not deny me this."

Ibid., i, 3. "If he should offer to choose, and choose the right casket, you *should* refuse to perform your father's will, if you should refuse to accept him."

Here *should* *refuse* stands for the modern *would* *refuse*.

Ibid., iii. "Besides it *should* appear."

The use of *should* in such sentences has survived to the present day, so much so, that I am doubtful, if it is not more correct than *would*.

Merry Wives, ii, 4. "If he had been thoroughly moved, you *should* have heard him so loud and so melancholy."

2nd part, Henry VI, iii, 1. "Glo. Why, 'tis well known that whilst I was protector pity was all the fault that was in me; For *I should* melt at an offender's tears, and lowly words were ransom for their faults."

Hundreds of examples might be added from Shakspere, to prove that his use of *shall* and *will* had not yet settled down to what we now consider correct. I cannot understand, how Sir E. Head,* taking only one passage (Hamlet V. 2), which he found quoted by Mr. Guest,† tries to explain it away, and how he can fancy he has thereby proved that Shakspere has

* Shall and will, p. 14.

† Transactions of the Philol. Society, March 13, 1840.

quite adopted the modern future. Sir E. Head has evidently not taken the trouble to look over a single play of Shakspere, to ascertain what were the facts.

EITHER.

There seems to be considerable uncertainty in the use and meaning of *either*. It is of Anglo-Saxon origin. *Aegtha* means *each* or *both*. But it seems early to have been confounded with the Latin *alter*, (French, *autre*,) and to have been used in the sense of *one* or the *other*, like the Latin *alteruter*. Bishop Lowth in his "Introduction to English Grammar," (p. 116,) condemns it in the following sentences:— 2 Chron. xviii. 9, "The king of Israel and Jehoshaphat king of Judah sat *either* of them on his throne." He recommends *each* instead, and no doubt, correctly. Levit. x. 1, "Nadab and Abihu, the sons of Aaron, took *either* of them his censer." 1 Kings vii. 15, "For he cast two pillars of brass, of eighteen cubits high apiece: and a line of twelve cubits did compass *either* of them about." Bishop Lowth says, "Each signifies *both of them*, taken distinctively, or separately: *either* properly signifies only *the one or the other*," for which reason the like expression in the following passages seems also improper: "They crucified two other with him, on *either* side one, and Jesus in the midst." John xix. 19. [Wielif, oon on this side and oon on that side.] "Of *either* side of the river was there the tree of life." Rev. xxii, 2. [Wiclis, on ecche side.] 1 Kings x, 19. "Proposals for a truce between the ladies of *either* party." Addison, Freeholder, 38.

In all the instances here quoted, *each* would be so far better than *either*, as it would not admit of any mistake. *Either* in the meaning *the one or the other*, is used most emphatically in what would be called a "locus classicus" in a dead language, by Milton, Par. L., l., 423, where he says, that—

"Spirits, when
They please, can *either* sex assume or both."

Here *either* must mean not *the one* AND *the other*, but *the one* OR *the other*; otherwise *both* has no meaning. But in other passages, Milton clearly uses the word in the sense of *each*, i. e. *both of them*; as, Par. L., V, 130—

“She silently a gentle tear let fall
From *either* eye, and wiped *them* with her hair.”

A tear from each eye, justifies the plural *them*. Again, Par. L., XII, 636—

“In *either* hand the hastening Angel
Caught our lingering parents.”

This passage, I confess, is very puzzling. *Either* must mean not *the one* OR *the other*, but *the one* AND *the other*; that is, both of them taken distinctively or separately. This being the case, the object ought also to have been expressed distinctively and separately: he caught in either hand *one* lingering parent. I do not, however, recommend this reading either on critical or aesthetic grounds.

The present practice in the use of *either* is still very unsettled. By some it is used for *any one*; for instance, “Which of these ten books do you like?” “I do not like *either*,” or, “I want *neither*.” This is utterly bad grammar.

It is clear we must confine the word to one of the two significations, the Latin *alteruter*, or *uterque*. It cannot retain both without detriment to the language. Now, although the signification *uterque* is the oldest, the other has taken its place in the majority of cases, so that I agree with Bishop Lowth’s canon.* “On which side will you sit, on the right or on the left?” “On *either*.” “Will you occupy the right side or the left?” “Both.” This is clear language and correct grammar. It is further confirmed by the adverbial use of *either*, as: “*Either* say yes or no.”

* Shakspere uses it thus: *Anth. & Cleop.*:

“Lepidus flatters both,
Of both is flattered; but he neither loves,
Nor *either* cares for him.”

EACH.

Each is the singular number and ought never to be used as a plural. Yet it often is found connected with the plural verb. For instance in the above quoted passage :

“ Let *each* esteem other better than *themselves*.”

It ought to be : “ better than himself.” Milton Par. L., V,
477—

“ Each in their several active spheres assigned.”

The same mistake is made with words of similar signification, as “ every one,” and “ any one,” in spite of the warning voice “ *one*.” Bentley, Dissert. on Themistocles’ Epistles, Lect, II—“ It is observable, that *every one* of the letters *bear* date after his banishment, and *contain* a complete narrative of all his story afterwards.” So also : “ He forgave *every one* *their* sins.” Addison, Spect. 25—“ I do not mean, that I think *any one* to blame for taking due care of *their* health.”

In spite of Addison’s authority, and the very frequent use of the plural with *each*, there can be no doubt that it is faulty, as for example in the following passages :

“ *Each* of us had reasons for *our* opinions best known to *ourselves*.” (Goldsmith.)

“ I shall venture to mention some qualities, *every one* of which *are* in a pretty high degree necessary to this order of historians.”—(Fielding.)

“ And so indeed may *any one*: for I know the captain will well reward *them* for it.”—(Fielding.)

Similarly *neither* is incorrectly used as a plural noun, as—

“ *Neither* of them *are* remarkable for precision.”—(Blair.)

There is a very peculiar use of *each* in the common versions of Euclid—“ If two sides of one triangle be equal to two sides of another, *each* to *each*, &c.” This is perfectly absurd. For if a and b be equal to α and β *each* to *each*, then $a = \alpha = \beta$ and $b = \alpha = \beta$, i.e., *each* of the former to *each* of the latter, which will make them all the same size. The word which ought to be used is “ *respectively*.” This would imply $a = a$, $b = \beta$. Just so we have the banns published when

more than one couple are named: "If any of you know cause or just impediment, why these persons should not be joined together—*respectively*—in holy matrimony, ye are to declare it." What awful result would follow, if the four or six persons were to be joined *each* to *each*? It might be supposed to be something like the promiscuous conjugal life of the Ancient Britons of whom Cæsar says, that a certain number of men married a certain number of women on communistic principles, discarding the idea of individual and peculiar rights.

I have endeavoured so far to trace the growth of the present English Future Tense, to account for its origin, to point out in what respect it is defective and where its use is still unsettled and likely to undergo further change. As for laying down practical rules, it is for an Englishman as unnecessary as it is difficult. For a thorough Scotchman it would be utterly useless, not because he is ill-bred or illiterate, but because he is from his birth accustomed to another formation of the Future verb, which not without a show of reason he may maintain to be as good as the English in itself. As for foreigners, I believe that they have no great difficulty in acquiring the proper use of *shall* and *will*, provided they make their studies of English on the south side of the Tweed.

OTHER AND OTHERS.

Other, as an Adjective when followed by a Substantive, takes no s in the plural: "Other lords besides thee have had dominion over us."

When used substantively it takes the plural sign, as—

Psalm xlix, 10. "The fool and brutal person die and leave their wealth to others." (Authorized version.)

Matthew v. "What do ye more than others."

Ephesians ii, "We were children of wrath even as others."

Yet this plural form seems by no means to be fully established. We often find the plural without an s, for instance:

in the Prayer-book translation of the above-quoted Psalm xlix, 10, we read—"and leave their riches for *other*."

Philip. ii. 3. "Let each esteem other better than themselves." (Cranmer translates *another*.)

Shakspere. Merchant of Venice, I, 1—

" Nature hath framed strange fellows in her time ;
Some that will evermore peep through their eyes, * *
And *other* of such vinegar aspect," &c.

Dryden. Satire of Juvenal—

" One sends him marble * * * and one the work of Polyclete * * while *other* images for altars give."

This is now quite obsolete. But the question arises whether *other* should have an s in the plural when it is not a Substantive of the masculine gender, but a simple Adjective to which a Substantive is to be supplied, for instance—Matt. xiii, 4. "Some seeds fell by the way side . . . 8. But *other* fell into good ground." There seems to be a difficulty in this use of the word. All the other translators avoid it. Wiclf says: "other seedis." The Rheims version has "othersome."* The Geneva and Cranmer have "some," Tyndale "part."

The modern practice is to add the s; for instance—"Some books are useful, others entertaining." This was not usual formerly. Shakspere says, Measure for Measure, iv. 4—

" Every letter he hath writ, hath disvouched *other*."

Ibid. iv, 5. "There's *other* of our friends."

Even living writers adhere to this use, as Dean Milman in his Memoir of Lord Macaulay—

" He lies at the foot of Addison's statute near to Johnson, and among many *other* of our most famous statesmen and men of letters."

Nothing else, nihil aliud, is in Shakspere often found expressed by *no other*. Measure for Measure, v. 1—

" If she be mad (as I believe no other),
Her madness hath the oddest frame of sense."

* *Othersome* is found also in Shakspere, Measure for Measure, iii, 2—"Some say he is with the Emperor of Russia; *other* some, he is in Rome."

2nd part King Henry 6th, iii. 2—

“ That when the King comes, he may perceive
No other but that he died of his own accord.

A. Trollope.—In no guise did he look *other* than a clever man.

THE ADJECTIVE.

Apart from such Adjectives, that are occasionally transformed into substantives, there are others, which become substantives with specific significations. They do not preserve the whole range of their meaning as Adjectives, but are restricted to a narrower limit. Such words are, to name a few—“ Goods,” not all things good, but a special kind. “ The wilds,” not all things wild, but wild countries. “ Blacks,” are not all persons black, but a specified class. Many things are green, without being “ greens.” “ A flat” is a particular kind of flat boat; “ flats” are level plains; “ flats and sharps” are restricted to music. So only one class of small things comes under the head of “ smalls”; not all things new are “ news”; or all things long or short, “ longs or shorts.”

The list of such substantives which are originally Adjectives is very long, but yet clearly defined, so that we are not at liberty to coin new ones; it includes—mortals, ancients, straits, levels, ills, evils, colds, elders, betters, seniors, juniors, savages, innocents, the open, the deep, the narrows, the rapids, the shallows, valuables,—to which may be added some words not originally Adjectives, as the *ins* and *outs*, the *ups* and *downs*. All these words assume the characteristic mark of substantives, the s of the plural. In some of them we can trace the gradual transition from the Adjective to the substantive character, when we find the same word sometimes with, and sometimes without the plural s, e.g., the heathens and the heathen.

The words hitherto referred to, though originally Adjectives, have become substantives in every way, in form and meaning, and should be enumerated in dictionaries as such.*

* Psalm xxxv, 15, is translated: “ Yea the very *objects* (*μάστιγες*?) came against me unawares.”

But every Adjective in the language can, under certain circumstances, be used substantively. It is with these that I specially propose to deal.

The English language has, in the article, the grammatical instrument, by which an Adjective can be raised to the rank of a substantive, but as the article has no different forms for the genders, this process can only take place under certain limitations. It is restricted to the following two cases :

1. To designate a noun of the neuter gender, singular number.
2. To designate a noun of the masculine or common gender and plural number. We say :—

The *evil* that men do lives after them ;

The *good* is oft interred with their bones.

Meaning *malum*, *bonum*,—das Boese, das Gute.

Milton, Parad. L., II, 278—speaks of “the *sensible* of pain.” Shakspere, 2 P. King Henry VI, I, 4—“Deep night, dark night, the *silent* of the night.” Milton freely adds qualifying words to such Adjective nouns, as Parad. L., II, 97—

“ His utmost ire * * *

Will * * * reduce

To nothing THIS *essential*.”

Parad. L., II, 406—

“ Who shall * * *

Through the PALPABLE *obscure* find out

His uncouth way; * * *

Upborn with indefatigable wings

Over the *vast abrupt*.”

This might be done legitimately with every Adjective, but, from the want of all adjectival inflections, and from an instinctive aversion of the English language to a prevalence of abstract nouns, and I might add of the English mind to abstract ideas, the use made of this grammatical law is very limited.

The second transformation of Adjectives in nouns of masculine or common gender and plural number is much more frequent, as : "Thou hast broken the teeth of the ungodly." Yet even here we mostly prefer adding a substantive, and it is not difficult to show that the English language long evaded the use of such Adjectives ; for instance, Matthew ix, 12—"They that be whole need not a physician, but they that are sick." The words of the original, *οἱ ἰσχύοντες* and *οἱ κακῶς ἐχοντες*, might have been translated by the Adjectives thus : The whole need not a physician, but the sick"; but only Tyndale and the Geneva version have the Adjective "whole" used substantively, and no translator has "sick" in that form. Wiclf has "men that faren wel," and "men that be yvel at ease." Cranmer translates "they that be strong, they that be sick." The Rheims translation has "they that are in health," and "they that are ill at ease," thus avoiding the use of the simple Adjective by a circumlocution.

The rule which confines the Adjective used substantively for the nouns of masculine or common gender to the plural is now strictly adhered to. But in older writers numerous deviations from it are found ; for instance, Psalm x, 2—

"The *wicked* in *his* pride, does persecute the poor." 3. "For the *wicked* *bousteth* of his heart's desire, and *blesseth* the covetous." 14. "The *poor* *committeth* himself unto thee."

Verse 15, in the Prayer Book, v. 17—

"Break thou the power of the *ungodly* and *malicious*, take away *his* ungodliness."

The last verse is rendered by the authorised version :—

"Break thou the arm of the wicked and evil *man* : seek out *his* wickedness."

This addition of the substantive *man* shows the awakening feeling of grammatical propriety, which felt ill at ease in using an Adjective without a noun in the singular number in the place of a noun. Other instances are Psalm xxxvi, 1—

" My heart sheweth me the wickedness of the *ungodly* : that there is no fear of God before *his* eyes."

Psalm v, 12—and many more passages.

The Adjectives limited in their use as substantives to the plural masculine or common, labour under other disabilities which show that they are to some extent intruders and aliens in the ranks of native substantives; they cannot take into their service determining and qualifying words like other substantives.* We can speak of the *godly* and the *ungodly*, but we cannot distinguish *these godly*, from those *ungodly*; we can speak of the *bold* and the *brave*, but not of *many bold*, or *few brave*.

Yet Lord Byron has the following passage, (Sardanap. V.)

Myrrha—"These men were honest; it is comfort still
That our last looks should be on honest faces.

Sardanapalus—And lovely ones, *my beautiful*."

Shakspere, Midsummer N. D., I, 1—

" Demetrius loves *your fair*."

Shakspere, Measure for Measure, II, 4—

" As for you

Say what you can, *my false o'erweighs your true*."

2 Thessalonians ii, 8—

" And then shall *that wicked* be revealed." (ο ἀρρωτος.)

Tennyson, Enid.—

" Died the death
Themselves had wrought on many an innocent."

In order to do this we must add a formal substantive to the Adjective, and we have recourse to the pronoun *one*. This serves as it were as a guaranty and a stamp, that the Adjective has really substantive value, or rather it stands itself as the formal representative of a noun, and therefore leaves the Adjective in its original grammatical function. We *can* say,

* The Neuter Singular may be qualified by determining words, e.g., *much good*, *this good* he has done me, &c. *What good?* *A universal good.* See the passages of Milton quoted above, Parad. Lost, II, 97, 406.

many bold ones, few brave ones, and we do say so ; but it cannot be affirmed that we like saying so.

There is an evident impression in modern writers and in good society, that this use of *one*, and especially of its plural *ones*, is clumsy, inelegant, and to be avoided. It is in fact dying out, and justly so, for it is very objectionable. We either supply it by a *bonâ fide* substantive and thus make the expression more concrete and clear, or we leave it out and let the Adjective take its chance of being understood without. I hardly think any modern writer will pen any thing like the following passage, which is taken from the Preface to the Authorised Version of the Bible : “ We never thought from the beginning, that we should need to make a new translation, nor yet to make a bad *one* a good *one*, but to make a good *one* better, or out of many good *ones* one principal good *one*, not justly to be excepted against.”

This is evidently an instance which shows, that the English language has really lost something by dropping all inflexions in the Adjective. In German, as in Greek, the Adjective is far more freely used as a substantive, and this is not only useful in common conversation, but also in the language of Poetry as well as of Philosophy. “ Durch das Schöne stets das Gute,” is hardly well translated, by “ the good always through the beautiful.” But especially difficult is the rendering of the feminine Adjective used substantively, e.g., “ Ach die Aermste, die in der Wiege Königin schon war”; “ Alas ! the wretched one, who from her cradle was a queen.” “ The wretched one,” is certainly rather a wretched translation.

Defects of this sort are hardly felt by the native Englishman, who confines himself to the study of his mother tongue. It is only by comparison with other languages, that they are found out. Similar defects exist in all languages. And this is one reason, why the study of a foreign idiom must tend to develop the logical faculties.

NINTH ORDINARY MEETING.

ROYAL INSTITUTION, 23rd February, 1863.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

W. J. Callon, M.D., Mr. J. Simm Smith, and Mr. Charlton R. Hall, were balloted for and duly elected members.

Mr. MOORE exhibited, in an aquarium, a living specimen of the *Lump-sucker* (*Cyclopterus lumpus*), taken recently at Tranmere, and presented to the Museum by Mr. Scott, of Tranmere Foundry. This fish is rarely taken in the river, but is not uncommon round the rocky parts of the coast.

Dr. COLLINGWOOD read a communication from Mr. David Robertson, of Glasgow, relating to the immense amount of material collected by fishermen, which might be rendered available, as follows:—

GLASGOW.

DEAR SIR,

* * * *

You will now better understand the nature of the want of which I was speaking to you, viz., *of a board of the leading naturalists appointed to name specimens.*

Laudable assistance has from time to time been rendered towards furnishing the means of accumulating knowledge in the various branches of natural history, but often with the prospect only of very small return. Now, does it not appear somewhat inconsistent that when the material is collected there should be no certain place for its recognition? Let us but have this, and we shall have the most essential encouragement to pursue our labour, and the most certain aid to secure prosperity, and to encourage and foster a love for natural history.

But in order that such a board might not be overtaxed with minor communications, I would suggest that *county branches* be appointed, through which the correspondence of the surrounding districts would have to pass, so that only as much as was *new*, or could not be decided by them, should be sent to head-quarters.

Another important advantage would arise from this arrangement, and that is, that if everything passed under the supervision of our committee, much of the existing confusion and synonymy would be prevented, and the best opportunities offered for improved nomenclature, the stamp of genuineness being lastingly fixed upon what they had passed.

Now, suppose this point gained, let us revert to the material. As an adjunct to your comprehensive plan of enlisting the mercantile marine, we have a most prolific source of supply, which has been in a great measure overlooked, viz., the *fishermen*, whose daily employment places them in the midst of the best opportunities for collecting the most valuable material in natural history.

This single fact, that they are seldom prepared to secure safely what may turn up, is one great source of the loss of many rare and valuable things, and for this obvious reason, that the whole interest which they get in the matter is so worthless (I may almost say mean) that it is not worthy of troubling themselves about it, further than in being civil and obliging for the time when called upon.

Compare the chances these men have for bringing to light the treasures of the deep,—who are compelled for their daily bread to employ every available hour, and over diverse ground,—with *our* few days dredging a-year, and then only for a few hours a-day, and generally on well-known ground.

But the difference of time, vast though it be, includes only a small portion of the advantages possessed by their extensive and diversified appliances, fitted as they are for the different branches of industry which they pursue. And in many cases, so expensive are these, that few or no naturalists would think of supplying them; and still to them we are indebted for many of our discoveries in marine zoology.

The common *dredge* is in requisition the whole year in supplying bait for their lines, &c., and for eight months in the year for scraping the bottom of the deep in the oyster fisheries.

The value of the *trawl net*, which is extensively employed, is sufficiently known for its inexhaustible supply of material to the naturalist.

The *long line* is no less efficient in its own department, varying in lengths according to the purposes and means of those who employ it. Not unusually it stretches from four to six miles in length, with from three to four thousand hooks attached, and it is let down often on a bottom so rough and deep that no net could reach, nor dredge work upon it.

Fish alone, attracted by the alluring bait are not the only product, for many other valuable things are brought up which get entangled with the lines and hooks, such as corals, sponges, &c., which would rarely or never come under the reach of any other snare.

Again, we have numerous adaptations of the net to the various sizes of fishes. But just let us glance at the vast scope of the *herring nets* alone. Twenty barrels of net are said to be about the average quantity used by each boat. Each barrel contains forty fathoms, but when mounted on the lead-lines or ropes ready for use, they measure only thirty-five fathoms, which is fully three-quarters of a mile of net for each boat.

Now, when we reckon the fishing fleet of an average station, Greenock, for example, which registers about 2,000 fishing boats, and take the low average of half-a-mile of net for each boat, it gives us an amazing length of *a thousand miles of net partitioning out the sea of one district*.

It must be observed, that although the novelties taken by these appliances are not expected to pay any part of the expense, still they have the same advantage as if the whole were fixed for them; and although they are not sought for, nor appreciated, they are necessarily found securing their proportional place in the general take, as certainly as any fish in the net.

Now, this is the particular point that requires our special notice. The novelties are rarely appreciated or cared for by the fishermen, but are as a rule rejected and thrust back into the sea.

Yet all this inestimable treasure, taken at an enormous expense, could be secured to science, I may say, comparatively for nothing; for the trouble of carrying away, it might be conveyed to us, would we only be at the pains to make it properly known where it could be conveniently carried to and *appreciated*.

I am, yours truly,

DAVID ROBERTSON.

Dr. Collingwood.

The following paper was then read :—

THE ANCIENT FAUNA OF LANCASHIRE AND CHESHIRE.

BY CUTHBERT COLLINGWOOD, M.A., F.L.S.

THERE is nothing so interesting to the cultivator of any department of Natural History as the ascertainment and collection of the natural productions which immediately surround him. Whether he restricts himself to some special department which claims his chief attention, or whether he indiscriminately masters all the Animal and Vegetable productions of his limited district, the occupation is, in both cases, one which every naturalist knows to be of the most fascinating description. Nor is it without important uses. The Fauna and Flora of any district should be best known by those who thus live upon the spot and devote considerable time and attention to it, and the Fauna and Flora of that country must be best understood, in which these ardent workers are most numerous. Hence there is no country so thoroughly explored as Great Britain and Ireland, although we must allow that there is still ample room for further observation and research ; and the young naturalist need by no means grieve himself with the idea that there is nothing left for him to do. The sentence written by Gilbert White in his twentieth letter to Pennant, "I find in Zoology, as it is in Botany, all Nature is so full, that that district produces the greatest variety which is the most examined"—may be regarded as an aphorism in Natural History, and is sufficient answer to such a groundless notion. But the value of accumulated observations carefully made and judiciously compared together, is well recognised by all the highest authorities of science ; and the results exhibit themselves in an increased and comprehensive know-

ledge of the distribution of animals and vegetables,—in the relation of physical conditions to the well-being of organized creatures—the influence of disturbing causes—and all the various aids to biological investigation included by Huxley under the general term “physiology of conditions.”

A local Fauna, however, it must be conceded, embraces but a point of geographical space—an almost infinitesimal fraction of the earth's surface,—not, however, that it is any the less valuable for this, for by the union of such fractional parts, considerable areas may in time be constructed and investigated. But there is another peculiarity of local faunas which is not so often considered, though perhaps of more importance,—and that is, that while they embrace but a fractional *space*, they refer also to a point in *time*, still more infinitesimal, (if I may be allowed such an expression), and bearing a much smaller proportion to the *duration* of organic life on earth, than the *area of the district* bears to the whole terrestrial globe. *Time present*, however important to us individually, is but a page in the volume of Nature—and while it must be allowed that it is the page at which the book lies open, and therefore one which “those who run may read,” nevertheless there are numerous other pages in the volume not inferior to it in interest. *Beyond* this, the book is sealed, but we may turn *back* the previous sibylline leaves, and on each we shall find traces, more or less confused, more or less legible, of what was once inscribed thereon, when *that* was the open page, and while as yet there was no man to read it. All is written in the same language, and the older inscriptions only differ from those which now lie before us, in having suffered from the destroying ravages of time.

As supplementary chapters to the “Fauna of Liverpool,” prepared with such assiduity by my friend Mr. I. Byerley, it has occurred to me that sketches of the *Geological Fauna* of our District, and what may be termed its *Historic Fauna* would

be interesting, and in many respects not without their use—completing as they would the history of animal life in this locality from the very earliest to the present time. In the present paper I shall confine myself to the Palæontological part of the subject, reserving for a future opportunity, the notice of the more recent animals, which, though now no longer reckoned as dwellers within our limits, have yet been remarked among us within historic times.

In our home counties, the "imperfection of the geological record," upon which so much stress has been laid by the ingenious Mr. Darwin, is remarkably apparent, and the long lapse of time which was demanded for the deposition and subsequent denudation of the geological horizon of our own district, is singularly devoid of any organic structures, which may afford a clue to the conditions of deposit, duration of period, or nature of animal life, which marked that epoch.

It would seem, indeed, that the seas which deposited these vast beds of red sandstone were never the source of that teeming life which we meet with in other geological formations, inasmuch, as the abundance of peroxide of iron which was diffused through them, and which gives the variegated colours to this rock, must have rendered those seas unsuitable for the performance of the vital functions of aquatic animals. It is chiefly to underlying strata, and to analogous deposits in other parts, that we are indebted for the elucidation of these questions; and although we may fairly take it for granted that certain groups of animals were characteristic of the era in question, I wish to confine myself on this occasion to such as have left imbedded in the rock undoubted traces of their previous existence.

For our purpose we may regard our two counties as devoid altogether of tertiary deposits, and of the hosts of interesting animals of high organization, which are found where these beds exist. *Post-tertiary* formations, in the form of littoral

deposits along the shores of Wirral and Lancashire, and peat mosses at various places inland, do however exist, and are not infertile sources of remains of great interest. So also, the upper portions of the Secondary system have quite disappeared, and neither the cretaceous nor the oolitic system find any representative, thus depriving us of the traces of the great land saurians, a host of fishes and other animals, which are found where these deposits prevail. Even in the Triassic system which is our own peculiar boast, the remarkable absence of the Muschelkalk, or shell limestone, leaves us only the pretty, but barren, Bunter and Keuper with their variegated marls,—and upon these Liverpool stands. But from a large portion of Lancashire the New Red has been washed away, and the more interesting carboniferous system has been laid bare, thus at once affording employment to the operative class, and objects of interest to the naturalist. In the indentations and interstices of the great Lancashire coal-field are visible limestone shales and millstone grit, the latter particularly being a highly fossiliferous deposit, however unpromising at first sight. Between Preston and Clitheroe, a further denudation has exposed the carboniferous limestone upon which the coal measures rest; and in the N.W. corner where it borders on Westmorland, Lancashire shares a small portion of the upper and lower Silurian beds of that county.

In Cheshire there is less variety of surface, the new red sandstones of the North giving place to saliferous marls in the centre, from which there appears to be a total absence of organic remains. The Keuper occupies all the mass of the county, being flanked by Bunter formations in the east and west; and the extreme eastern side possesses a small coal field.

It is, then, the coal-series which is the great source of organic remains in Lancashire; the *middle* coal measures being the richest in fossils—the *lower* coal measures contain-

ing many of great interest, and the *upper* being but scantily developed. In addition to these, the millstone grit, "is by no means poor," except in the neighbourhood of Wigan, whence no fossils have yet been obtained. Plants are abundant as we might expect, but it is no part of my object to enter upon the fossil flora. Among the *coal roofs* as they are termed, "those of black shale contain bivalve shells, and detached scales and teeth of fishes; and with *Microconchus carbonarius*, and casts of *Cyprides* sometimes constitute nearly the entire mass. In the *blue binds* are beds of *Unio* and other shells; and almost all the black shale roofs of the lower field teem with remains of *Pecten*, *Goniatites*, *Posidonia*, and fishes. Shales with highly bituminous schists forming roofs, occur at Peel and Pendleton, and contain abundant remains of fish, mostly entire. (See Prof. Williamson, on fishes from Peel; Report British Association.) At Bradford and Ardwick, in the roof of the thin coal intercalated with limestone, the detached teeth, bones and scales of fish occur, mingled with countless myriads of *Cypris* and *Microconchus*." (Binney, Lancashire Coal Fields.) With regard to the distribution of fossils in the seams themselves, it is worthy of remark, that "cannel beds, generally found on the top of the coal, nearly always contain the remains of fishes, and often bivalve shells, but hitherto no traces of *Microconchus*; * * * but in the Lancashire coal-field no remains of fishes or shells have yet been found in the coal itself." *Ibid.*

It will be best to refer to the members of the geological fauna of Lancashire and Cheshire in an ascending series, commencing with those lowest in the organic scale, viz., the Protozoa. With the exception of the shelled Foraminifera, these animals and the Cœlenterata are seldom preserved, on account of their perishable nature. In the neighbourhood of Manchester are some Permian beds, consisting of red marl, containing numerous thin bands of limestone (the thickest

being about eighteen inches) both fossiliferous. Here occurs a sponge of the genus *Tragos*, and some shells; and it should be mentioned, that Mr. Cunningham published a sketch (in No. 4 of our Proceedings) of what he believed to be "a cast of an impression of a Medusa, which retained in a very perfect manner the proofs of a similar conformation and constitution to these inhabiting our present seas." This object was obtained from the West side of Storeton Hill, and "the cast stands in relief about half an inch above the surrounding surface or bed of the slab, and must, therefore, have been impressed to a corresponding depth in the upper bed of the substratum." This, I believe, is the only instance of such an animal having been supposed to be found in this rock. But the lower forms of life (including Zoophyta) attain their greatest development in the distant corner of Lancashire, where the upper and lower Silurian beds come to the surface, in the neighbourhood of Coniston. Here are met with several species of *Favosites*, *Nebulipora*, &c.; several Crustacea, of the genera *Cheiurus*, *Illænus*, *Lichas*, *Phacops*, *Beyrichia*, and *Trinucleus*; as well as Bryozoa, of the family *Tubuliporidae* and *Escharidæ*. But these are, as it were, accidental members of the Lancashire fossil fauna; and I shall only further refer to them by appending a list of the species.*

Annelids are not frequent, though what are supposed to be the tracks of them are found associated with reptilian footprints in the lower Keuper beds of the new red sandstone of Lancashire and Cheshire. Two species of Annelids are, however, characteristic of the coal measures, viz., *Arenicola*

* The following are the characteristic fossils of the lower Silurian beds about Coniston :—

<i>Zoophyta.</i>	Sarcinula organum (Astræidae).
<i>Heliolites megastoma</i> (Milleporidæ).	Petraiæ æquisulcata (Cyathophyllidæ).
<i>— petaliformis.</i>	<i>— binia.</i>
<i>Nebulipora explanata</i> (Favositidæ).	<i>Annelid.</i>
<i>Stenopora fibrosa</i> do.	Tentaculites annulatus (Tubicola).

carbonaria, (described by Binney, Memoirs Manchester Lit. and Phil. Soc., 10, t. I, fig. 2.,) and *Spirorbis carbonarius*, both found in the lower coal measures of Wigan; the latter also, found lower down in the millstone grit of the Holcombe brook series; and passing upwards into the middle coal measures of Bolton and Wigan, and the upper coal measures at Patricroft.

The Crustacea of the carboniferous series are not few, and principally entomostracous in their affinities. The most characteristic forms of the Lancashire coal-field belong to the Phyllopod genus *Beyrichia*. *Beyrichia Binneyana* (Jones) is a common little coal crustacean, and is found in the lower coal measures at Bispham, near Wigan, and Rainford. A second species, *B. arcuata*, is also a common coal fossil, formerly described as a Cypris; it is also found in the millstone grit of Holcombe Brook—in the lower coal measures of Bradshaw, near Bolton, as well as in the middle coal measures of the same district. A species, undetermined, is also found below the gannister coal near Bolton; and indeed this little crustacean genus was formerly regarded as Silurian only. Mr. Salter remarks, that “one of the most striking fossils * * * was found in searching the refuse of the Pendleton pits, for the third time. It was a huge *Eurypterus*, shortly to be figured in the Journal of the Geological Society, and which

Crustacea.

Beyrichia strangulata (Phyllopoda).
Cheirurus clavifrons (Cheiruridæ).
Illænus Murchisoni (Asaphidæ).
Lichas laciniatus (Lichadidæ).
Phacops conophthalmus (Phacopidæ).
Trinucleus concentricus
 (Trinucleidæ)

Bryozoa.

Diastopora heterogyra
 (Tubuliporidæ).
Ptilodictya explanata (Escharidæ).
 — lanceolata.

Brachiopoda.

Leptoena tenuissime-striata
 (Strophomenidæ).
 — transversalis.

Leptoena antiquata.

— *deltoides*.
 — *var. β* , *undata*.
 — *pecten*.
 — *tenuistriata*.

Orthis Actoniae (Strophomenidæ).

— *alata*.
 — *biforata*.
 — *calligramma*.
 — *elegantula*.
 — *insularis*.
 — *porcata*.
Pentamerus lens (Rhynchonellidæ).
Spirifer terebratuliformis (Spiriferidæ).
Cephalopoda.

Orthoceras vagans (Orthoceratidæ).

rivals in size the great species figured by Dr. Hibbert. It has huge mamillated spines on the head and forward rings, and is here called *Eurypterus mammatus*."

But it is to the Mollusca that we must always look for the greatest number of remains of an ancient Fauna. The shells of Molluscous animals being of a compact and mineral substance, stand much more chance of preservation than the crustaceous integuments of crabs, or any other less hard parts of animals ; and the completeness of their preservation is one cause of their value in determining the age of geological formations.

A *Lingula*, that persistent form which has left its stamp throughout the whole of the stony record, and still survives in our recent seas, occurs in the millstone grit at Rivington Pike and also in the lower coal measures north of Bolton. *Ariculopecten papyraceus* is a marine shell of the millstone grit and lower coal, (but scarce in the western part of the Lancashire coalfield), and *Microconchus carbonarius* of the upper coal series ; as is also *Modiola Macadami* (Binney, Tr. Lit. and Ph., Manch., xii, 38). *Unionidæ* are generally diffused ; but above the flag series, bands three inches thick are entirely composed of individuals of a large size. In the St. Helens district, twenty yards above the Rushey Park coal, there extends over a large tract of country an impure ironstone band, full of *Unio robustus*, called by the miners " cockle-shell bed ;" a similar band is also generally prevalent some yards above the Little Delf or Arles mine (Prescot, 11). Many of these *Unios* have been restricted under a new genus, *Anthrocosia*, of which several species are named, viz. :— *A. acuta*, in the middle and lower coal, and underlying beds ; *A. subconstricta*, in the lower ; *A. ovalis*, *robusta*, and *aquilina*, in the lower and middle series ; and *A. centralis* in the cannel of the middle measures of Bolton. The presence of these species, plentifully in one formation and sparingly in

the other, is regarded by Mr. Salter as no argument against the general fact that the shells of the middle and upper coal measures differ as a whole from those of the lower; and the long lapse of time consumed in the deposit of coal is well illustrated by this change of the fauna in a very small geologic space. The *habitat* of *Anthrocosia* (or *Unio*) appears to be a matter admitting of some doubt, for although formerly considered as certainly a fresh-water shell, *A. acuta* is found at Clitheroe in a formation undoubtedly marine.

Other very characteristic shells are the genera *Anthracop-tera* (including species formerly embraced under *Myalina* and *Avicula*) and *Anthracomya*—the former extending from the millstone grit to the middle coal measures, and the latter from the lower to the upper coal measures, where it is the only abundant shell; being found also in the Patricroft haematite, which supports the Permian rocks near Manchester. These Permian beds rest unconformably upon the upper coal measures, and the thin limestone bands in them are very fossiliferous, containing the characteristic *Axinus* (*Schizodus*) *obscurus* and species of *Bakewellia* and *Turbo*. “At Manchester the magnesian limestone disappears, almost mingling with the clays of the new red sandstone; but it contains, nevertheless, the *Axinus* and other fossils.” (Williamson.)

Besides these, the remains of Cephalopodous Molluscs are not wanting, and the highest type of Invertebrata is represented by species of *Orthoceras* and *Goniatites*. They are both found in the black shale roofs of the lower coal, near Bolton, and as many as six species of *Goniatites* occur in the millstone grit, and two in the lower coal measures, but none in the middle or upper. Here, again, the change of the invertebrate Fauna, which appears to have taken place between the lower and middle coal measures, is well illustrated. “Several of the genera,” says Mr. Hull (Bolton, p. 7), “and some of the species found in the lower coal measures of this and

other counties of England and Wales, pass upwards from the millstone grit, the Yoredale rocks, and even the mountain limestone. On the other hand, till very recently, the mollusca of the middle coal-measures were confined to two or three genera of bivalves (*Anthracosia*, *Anthracomya*, &c.) The researches of my colleague, Mr. A. H. Green, and myself, in the neighbourhood [of Bolton], have added the genera *Orthoceras*, *Nautilus*, *Discites*, and *Aviculopecten*; one species of the last-named genus, *A. papyraceus*, ascends into the top of middle coal-measures of Ashton-under-Lyne. But even with this addition, a considerable number of species may be considered as terminating with the lower coal-measures themselves."

It thus appears that the Goniatites of the millstone grit and *lower* coal, are replaced in the *middle* coal-measures, by species of *Nautilus* and *Discites*.

It may be interesting to mention in this place that my friend Mr. I. Byerley, of Seacombe, has met with remains on the shores of the Mersey, which appear to resemble the deposits known as *kitchen middens*. He informs me "that strata of shells exist at Wallasey, and in the sandhills along the shore, between Leasowe and Hoylake, which seem to resemble, on a small scale, the collections noticed by Mr. Lubbock, under the name of "shell mounds," in Scotland, and of "Kjökenmöddings," in Denmark. On going down the hill, just before entering Wallasey village, there is a bank, which may be twenty feet or more high, on the right hand side; two-thirds of its height is composed of sandstone, above which is a covering of earth from four to six feet in thickness; between the latter and the sandstone, a stratum of mussel-shells, about eight inches thick, may be seen. The shells are partly whole and partly broken; all, of course, are free from epidermis, but the striated colouring is as distinct as with recent specimens of the species. Having, however, lost much

of their animal element, they are more friable ; and on being placed in water for the purpose of cleansing them, the outer layer of shell structure readily separates from the nacreous interior. This stratum appears to have no other species of sea-shell intermingled : the terminal whorl and apex of a univalve, however, was just perceptible, which, on careful removal from the matrix, proved to be *Helix aspersa*. This bed is about a mile from the present sea-shore."

The same gentleman has also observed either one or two strata of shells in the sandhills, on the shore between Leasowe and Hoylake. Not having visited the spot for some years, however, he can only report from memory that they are composed exclusively of cockle-shells. It is worthy of remark that these beds are situated very close to the place where the Anglo-Saxon antiquities were found at the Great Meols.

May we not infer that these shell strata are composed of the castaway refuse of mollusks which had been consumed as food by our prehistoric neighbours ? *

The remains of vertebrated animals which have been hitherto discovered in our home counties are by no means numerous ; but meagre as is the list, it is full of interest, more especially as on the one hand it connects us with the most ancient past, and on the other brings us down to historic times. Fishes are always amongst the most interesting of fossil remains, on account of the completeness of their preservation in many cases. The enamel of the scales which cover their whole bodies, protects the soft parts so effectually, that it often happens that the form of the body is preserved in an unchanged condition, and offers facilities for description and comparison with those of our own day equalled by no other

* Several remains of Mollusca characterize the glacial deposits on the banks of the Mersey, such as *Tellina solidula*, *Nucula oblonga*, *Cardium*, *Nassa*, and particularly *Turritella communis*, which passes upward from the sandy gravel of the lower drift deposit into the boulder clay above. From a well sunk at Poolton, in Wirral, fragments of *Mactra*, *Venus*, *Astarte* (?), and other shells were also obtained.

class of animals. The coal measures have afforded some remarkable fishes belonging to the great Placoid and Ganoid divisions. Of these, *Ctenoptychius denticulatus*, (a cestraciont which commences to appear in the Devonian rocks, and is found in the coal measures near Manchester, and in the cannel at Wigan), represents the Placoid fishes, whose remains commence to make their appearance in the Lower Palæozoic strata. Another Placoid, *Diplodus gibbosus*, one of the Hybodonts, which appear a degree later upon the stage (viz., in the middle Palæozoic), is met with in our carboniferous shale. Other Placoids are *Gyracanthus* (carboniferous) from the fish beds, or black beds of cannel, ironstone, or shale of Pendleton ; *Ctenodus*, from the same situation ; *Diplodus* (Pleuracanthus—carboniferous), from Bispham, near Wigan ; and *Helodus*, a carboniferous cestraciont from the millstone grit of Wilder's Moor, Horwich, near Bolton. Among Ganoids is the *Holoptychius* (which commences in the Devonian strata), remains of which were found by Mr. Binney in the black bands at Pendleton, near Bolton ; scales are also found above the gannister coal at Bradshaw ; and the late Mr. Peace obtained good specimens of this fish from the cannel at Wigan. It is also met with in Laffog Colliery, near Copull. Other Ganoids are *Platysomus* (a carboniferous lepidoid species), also found at Pendleton ; *Cœlacanthus lepturus* (also carboniferous), obtained at the same place ; at Bradshaw, near Wigan (lower coal measures), scales only ; and from the lower coal of Bispham, near Wigan ; and *Diplopterus* (a Devonian sauroid) from Pendleton, and beautiful specimens from the cannel at Wigan. The genus *Rhizodus* is found at Bispham, in the gannister ; a species is met with at Freeman's Colliery, near Copull, between the yard and bone seams ; and a new species has lately been discovered—designated by Mr. Sulter as having scales eroded or ridged in concentric lines—in the Whittle Green Colliery, near

Copull, above King Coal. *Rhizodus granulatus* is also found in the *three-yard seam*, Bolton, and the vitriol works, two miles from that town ; and scales in the Holcombe series of the millstone grit. A new species has also been found in the upper coal at Patricroft, near Manchester.

But perhaps the most interesting of the ancient finny races which once swam over submerged Lancashire, is the Ganoid *Megalichthys Hibbertii*, which has been found in the coal measures near Wigan (cannel), Manchester, and in the gannister, or lower coal series, of Bispham, near Wigan. This genus also first makes its appearance in the Devonian series, though it is more characteristic of the coal formation. The *Megalichthys* belongs to the Sauroid division of Ganoids, "combining with many of the characters of a true fish, many close and striking analogies with reptiles ; the teeth more especially so closely resemble those of some Crocodilean animals, that when first discovered, they were immediately referred to that class." These teeth are of great size, and conical, having also a conical hollow at the base in which a new tooth is prepared, so that there may be a constant succession, as in reptiles. A single tooth has been found measuring nearly four inches in length, by a breadth of nearly two inches at the base. These formidable teeth, intermingled with smaller ones, are scattered all over the inside of the mouth. The scales also of this remarkable fish closely resemble those of crocodiles, being angular and shining, and interspersed with large rounded scutella measuring five inches in diameter.

Another Ganoid fish which does not extend lower than the coal-measures is found in those of Lancashire, viz., the Lepidoid, *Palaeoniscus Egertoni*, found at Ardwick, near Manchester, and scales of which are also met with at Patricroft. Our *Palaeoniscus* is an exceptional fish to the generalization of Agassiz, who founded upon a great number of coincidences the rule that "the scales of *Palaeonisci* of the coal are almost

universally smooth, while those of the magnesian limestone are almost universally striated or sculptured."

No Ctenoid or Cycloid fishes are found lower than the chalk.

If, however, it be the fact that the Triassic seas were inimical to aquatic life, it still remains to be proved why no vestiges of terrestrial animals should be found imbedded in the compact sandstone. Probably, the slow deposition and shifting character of those ancient sands may account for their total absence. If is, therefore, the more wonderful that, under the most disadvantageous circumstances, while material forms and solid bones have entirely vanished, transitory phenomena should have left traces as distinct to the eye of the nineteenth century as they would have been had any one been present, ages since, at their production. Where great terrestrial reptiles, and probably other animals, have left nothing but a tooth here and there to tell the tale of their ponderous existence, the gentle ripple of that chalybeate sea upon the sandy shore, the pattering of rain-drops upon the beach, and the direction of the passing breeze, have all left their imprint, which has defied the changes and convulsions of incalculable ages, and remains to this day as distinct as though it had been engraven with a pen of iron upon a rock of adamant. It is to the presence of thin laminæ of clay interspersed between the lower keuper beds of sand—"this ancient shore washed by still and quiet waters," and to this day shewing the cracks where it dried under the noonday sun—that we owe this marvel; and it is to the same simple cause that we owe the yet more interesting and astounding fact of our being acquainted, as Dr. Buckland observed (Address to the Geological Society, 1840), "with the certainty of cumulative evidence" not only with the *existence* of a race of gigantic amphibious reptiles, but with a familiar knowledge of their movements and of their haunts, "the

directions of the wind, the depth and course of the water, and the quarter towards which the animals were passing, as indicated by the direction of the footsteps which form their tracks." Here is a marvellous combination of circumstances, unmatched in the record of the rocks. Not even the Mammoth of the Lena, clothed with his flesh and hairy skin, "in his habit as he lived," affords so vivid a picture of life and economy in the remote recesses of time when no human eye was created, as does this wondrous uplifting of the mysterious veil, in the ancient days of the new red sandstone. Surely the trias is redeemed by this one fact from the opprobrium which attached to it from its poverty of fossil remains.

The *Cheirotherium*, as the animal in question is usually called, appears to be identical with those designated at various times the *Mastodonsaurus*, *Salamandroides*, *Phytosaurus*, and *Labyrinthodon*. Although the *structure* of the foot is still wanting, the great resemblance of the footsteps to those of certain toads, as well as other circumstances, renders it almost certain that it was a gigantic *Batrachian*, and not a *Marsupial* as originally inferred by Kaup. The *Cheirotherium* has left but little *substantial* record of his existence anywhere, and in our own Triassic rocks, there have been found no bones or teeth whatever; and the record of the reptilian races, which undoubtedly existed at this period, is confined to *ichnites*, or fossil footsteps. From these it is deduced that probably several species of *Cheirotherium* crawled upon the new red sandstone beach of Cheshire. One of these, *Cheirotherium Hercules* (the *Labyrinthodon giganteus* of Owen, Geol. Trans., 2nd series, vol. 6, p. 537) has left its traces in the Trias at Tarporley, Cheshire. A second species, *C. Kaupii* (the *Labyrinthodon pachygynathus*, of Owen, Geol. Trans.) is afforded by the Trias at Lymm, near Altrincham, Cheshire. A species, *undetermined*, is also found at Lymm, and described in the Proceedings of the British Association, 1842, sect⁸, p. 56). The footsteps

most familiar to all of us are those of the Storeton Quarry, an account of which will be found in the Geological Society's Proceedings, vol. 3, p. 12—14. These are found on the under surface of the Sandstone, in what is called the footprint bed of the Keuper. They are moulded upon impressions originally received in the soft mud or clay upon which the animals walked. They were first discovered, in 1838, by John Cunningham, Esq., F.G.S., of Liverpool.

“The footsteps found in the quarry at Lymm, in Cheshire, vary from $\frac{7}{8}$ th of an inch to $1\frac{1}{4}$ inch in length, and sometimes reach the length of four inches ; and upon a slab of dark red sandstone is an impression 10 inches long, but of a peculiar form, as though the foot that made it had been furnished with claws. These beautiful impressions appear to have been left upon a thin stratum of the finest clay, which was so well prepared to receive the mould as to leave a cast so delicate as to give the texture of the skin that covered the sole of the foot. This appears to have been covered with small papillæ, about 100 to the square inch in the larger specimen, and 220 to the square inch in the smaller specimens ; shewing that the sole of the foot was furnished with a rough skin, such as might have been expected from an animal that walked upon a sandy shore.” There is also reason for believing that this Batrachian was not smooth externally, but was protected, on certain parts at least, by bony scutella.

Besides these, and associated with them, other reptilian footsteps are extremely frequent. Such impressions occur at the Storeton Quarry, at Lymm, at Weston Point, near Runcorn,—nearer Liverpool, in Flaybrick Hill, and in Liverpool itself, in an old quarry, long worked, and situated in Rathbone street. The difficulty of determining the nature of such footsteps, in the absence of any more material clue in the form of bones is, of course great, and any guess is, therefore, liable to error. Morris, in his catalogue of fossils, refers to them as

species incerte reptilium. They have, however, some of them received names, and those of Storeton are called *Rhynchosaurus*. Some slabs from that quarry were examined by Dr. Buckland, who concluded that the tracks of four or five smaller animals were present, apparently small aquatic and land tortoises (Geol. Proc., iii, 59). In No. IV. of our Proceedings are some most interesting figures of footprints from Storeton quarry, which are all of a very singular form, found by Mr. Cunningham on the West side of the hill. They appear to be of two or three different kinds of animals, and scarcely a guess can be made as to their nature, though I should suppose fig. 4 to be crocodilean origin. Small tortoise-like impressions occur also at Weston Point, where they are found in company with the steps of *Rhynchosaurus*; but Professor Harkness observes, that at Storeton, and also at Lymm, the footsteps of this animal occupy a high position in the Bunter sandstone.—British Assoc. Rep., 1850, p. 84.

With regard to Birds, although some footsteps of a very problematical character have been referred by observers to this class, the existence of ornithichnites in the Trias of Cheshire is not, I believe, recognised by the best authorities. Not, however, that there is no precedent for the traces of birds in this geological horizon, for the new red sandstone of the valley of Connecticut is remarkable for the number of such traces; but it is worthy of notice that these usually most nearly resemble the footprints of *Grallæ* or wading birds. Figure 3, in No. IV of our Proceedings, purports to be the “cast of an impression of a web-footed animal with three toes, probably a bird.” But the Connecticut *bird*-prints appear in no cases to be those of web-footed species. Professor Harkness also exhibited to the British Association, in 1850, a drawing of the steps of a biped from Weston Point, near Runcorn, referring to it as the first which had been noticed in this country, but both this and Mr. Cunningham’s figure are classed by Morris as *Reptiles of uncertain species*.

It is, however, to the most superficial deposits that we must look for any indication of remains of the Mammalian fauna of ancient times, and here, indeed, we meet with traces of the greatest interest. We have no bone beds or bone caves abounding in a variety of pre-historic remnants of wild animals, nor have we any pleiocæne or other tertiary deposits wherein to search for them, but we have evidences of changes which have taken place along our coasts in times bordering upon the historic era; and entangled among the submerged trees of ancient groves, we meet with the denizens of forests probably coeval with our early and uncivilised ancestors. In the peat bogs and mosses, also, which characterize the county palatine, an occasional discovery is made which betrays the previous existence of animals long since regarded as foreign to these regions. Such was the hippopotamus, of which a complete skull is figured in Leigh's Natural History of Lancashire (1705); and described as "an exact cutt of that hippopotamus or sea-horse head, dug up under a moss in Lancashire, which I frequently saw." (Tab. 6, figure 4.) There is no doubt about this figure, and Dr. Leigh, as well as Dr. Buckland more than a century after him, considered the discovery as conclusive evidence of the universality of the Noachian deluge. Of this skull, Owen remarks (British Fossil Mammals and Birds, p. 401), "It was probably from freshwater marl that the entire skull of the hippopotamus was obtained, which is stated by Leigh, in his History of Lancashire, to have been found in that county under a peat bog, and from which work Dr. Buckland has copied the figure given in plate 22, figure 5, of his *Reliquiae Dilurianæ*. From the indication of the second premolar in this figure, we may, I think, discover the greater separation of the tooth from the third premolar, which forms one of the marks of distinction between the fossil and recent hippopotamus." This is perhaps the oldest of our Mammalian remains; and in other parts of

England, as in the valley of the Thames, the hippopotamus was associated with the mammoth ; while in Yorkshire, Dr. Buckland observes that there was a long succession of years in which the elephant, rhinoceros, and hippopotamus, had been the prey of the hyenas, which, like themselves, inhabited England in the period immediately preceding the formation of the diluvial gravel.

The animal, perhaps, next in point of interest, as in size, is the great Irish Elk (*Megaceros hibernicus*). Although, however, of larger dimensions than the great American Moose, the size of the Irish Elk was not proportioned to the vast spread of its majestic antlers ; nevertheless, it stood fully six feet high to the top of the shoulders. The question of its contemporaneity with ancient man has lately been mooted ; but there does not appear to be sufficient evidence to raise it from the society of the mammoths and rhinoceri just referred to. I am not at present able to give the particulars of the discovery of this magnificent animal in our county, but I will only say that the antlers have been found in the pleistocene freshwater deposits, or, in other words, in the marl or gravel beneath peat bogs.

At the time that Professor Owen wrote his book upon British Fossil Mammals and Birds, Lancashire and Cheshire yielded but little material for such a list, beyond what I have already mentioned. Since that time, however, the existence of other interesting members of the ancient Fauna have been discovered in several localities. The great submarine forest at Leasowe, as might have been anticipated, has yielded evidence that it was once inhabited, and horns and skulls have from time to time been discovered in the peat and clay. But evidence is not wanting to shew that the submergence of this tract has taken place with great rapidity, and that the date of the forest's growth may not be far back in the historical era. The present lighthouse, when built in 1764, was

half a mile from the sea, and would long ere this have shared the fate of the previous one, which the sea gradually engulfed, had it not been that the absolute necessity of resisting the insidious encroachments of the sea had been recognised, and the embankment constructed in time. The old pool, or site upon which the town of Liverpool was built, and Wallasey Pool, upon the Cheshire side of the river, have probably been longer covered, and the deposits extend to a greater depth, forty feet below high water mark beneath the custom-house, and upwards of thirty-five feet in Wallasey Pool. When the custom-house was built in 1829, stags' horns, and fragments of bones (of the character of which I am not aware) were found associated with stumps of trees in situ at a depth of twenty-seven feet below high-water mark. But the most remarkable discoveries were made during the excavation of Wallasey Pool for the construction of the Birkenhead great float. Here were brought to light several horns, skulls, and bones, from depths varying from thirty-two to twenty-five feet below the level of the surrounding land, and several feet beneath the original bed of the pool, associated with numerous stumps and roots of trees in situ at various levels. These remains are of the greatest interest, and have been well described, and some of them figured, by Mr. Moore, in a paper read before the Historic Society, in 1858.

The first relies which claim our notice from these sources are the skull and horns of the Great fossil Ox (*Bos primigenius*), a species regarded as distinct from the common ox of our day, and at least one-third larger than the largest modern breed, with much more massive horns. Owen gives reason to believe that this Great fossil Ox, though quite extinct at this time, has lived within historic times, and identifies in *Bos primigenius* the great Hercynian urus, which Caesar describes as so much surpassing domestic cattle

in size.* A formidable animal must this have been, and it seems far more reasonable to suppose, independently of other grounds, that our own satisfactory domestic cattle were always distinct from, rather than degenerated descendants of, the great fossil *Bos primigenius*.

In the excavations at Wallasey pool, Mr. Moore relates that several horns and portions of skulls of this species were disclosed, two of the horns being found at the foot of one of the trees at the higher end of the pool. The length of one nearly perfect skull was 2 feet 4 inches, and the span between the tips of the horn cores 2 feet 5 inches. Sir Edward Cust possesses an unbroken skull of *Bos primigenius* obtained from the submarine forest at Leasowe, where it was found imbedded in peat and clay; and Mr. Morton has the horn of a female, or young individual of the same species, found at Bootle.

The other species of ox found in Wallasey pool was *Bos longifrons*, a much smaller species, first obtained by Hunter from an Irish bog. This animal, remarkable for the elongated form of the skull, is suggested as the wild race of indigenous cattle which our aboriginal ancestors reduced to domesticity. Its horns were short, measuring only 6 or 7 inches in length, and 12 inches in span, a character which our short-horned Highland and Welsh cattle still possess. A very fine and perfect skull of this species was among the treasures of Wallasey pool, and now in our Museum, and others have been found at Leasowe and Hoylake.

The rib of a large cetacean animal was also found in the excavations at Wallasey pool; and the humerus of a Whale has been dug out of the peat composing the submarine forest opposite Leasowe Castle.

* "Tertium est genus eorum qui Uri appellantur. Hi sunt magnitudine panlo infra elephatos, specie, et colore, et figurâ tauri. Magna vis eorum et magna velocitas; neque homini, quam conspexerint, pareant. Amplitudo cornuum. et figura, et species multum a nostrorum boum cornibus differt."—Cæsar, de Bello Gall., Lib. vi, c. 20.

If, in the two species of *Bos* just referred to, we can trace glimpses of our ancient *Fanna* as it existed in the time of the Roman invasion of Britain, the next animal to be noticed brings us down directly to our own day, for the *red deer* (*Cervus elaphus*) although found associated with the before-mentioned extinct animals, is still living in the northern and southern confines of Great Britain, though no longer a denizen of our own neighbourhood. Not longer ago, however, than Leland's time, red deer were plentiful in "the fayre and large forest of Dalamare," (It. iii. 42), as well as the forests at Low Furnis; and the proof of the long existence of these animals is found in the fact that their remains are those most frequently met with in the recent shell-marls of Scotland, associated with those of the ox, boar, horse, dog, hare, fox, wolf and cat, in the order of their relative frequency, according to Sir Charles Lyell. Pennant remarks upon the "horns sometimes met with in our own kingdom." "These," he says, "are evidently of the stag kind, but much stronger, thicker, heavier, and furnished with fewer antlers than those of the present race; of these some have been found on the sea coast of Lancashire, (Ph. Tr. 422); and a single horn was dug a few years ago out of the sands, near Chester." (Br. Zool. vi, p. 62.) Four imperfect horns of the red deer were taken near the same spot as the great fossil ox, in Wallasey pool, but finer specimens have occurred in other parts of Lancashire. "Hopkins transmitted the sketch of an antler of a large red deer to the Royal Society, which is figured in vol. 37, No. 422, of the Phil. Trans. The terminal branches of the crown are broken off, yet the length of the antler is 30 inches, the circumference of the base 10 inches, and the length of the brow antler $16\frac{3}{4}$ inches. This was drawn out of Ravensbarrow Hole, adjoining Holker Old Park, Lancashire, by the nets of a fisherman in 1727. The tide flows constantly where it was found, and the land is very

high near it." (Owen, p. 473.) Similar horns have been found in the submerged forest at Leasowe.

In Leigh's Natural History of Lancashire there is an account of a fine pair of horns of the red deer, accompanied with a carefully described plate. (Tab. 5.) "This figure is the head of a *stag of Canada*,"* found 8 yards within the marle in Lancashire, with the vertebrae of the neck adhering to the head; one as large again as this was found 4 yards under the moss in the Meales (Meols) in the same county." The figure in question represents the horns as about 41 inches in length, with a span of 35 inches "between the two middles." Of this specimen Owen remarks—"The antlers attached to the head of the stag found beneath a peat moss, and figured by Leigh, attest an animal of equal size" to that figured in the Phil. Trans. Camden also mentions the frequent occurrence of horns of the legh, or scofe, or large stags' horns as "frequently found underground here." (Britannia 3, 142.)

In the account of the visit of the Literary and Philosophical Society to the submarine forest at Leasowe in 1845, it is stated that "Dr. Watson * * reported that bones picked up by him in the same district * * a tibia and a vertebra, had been identified by Dr. Scouler as belonging to the elk or moose deer, though of a small individual of the species." According to Mr. Geo. Thompson, the head and antlers of the same animal were picked up here also by some members of the British Association in 1837. They are deposited in the Museum of King's College, London." (Pro. Liv. Lit. and Ph. Soc., No. 1, p. 106.) †

* *Cervus Canadensis*, The Wapiti, (an error), the form of the horns being very similar to that of the red deer.

† Dr. Pollok, the Curator at King's College, informs me that these reliques do not exist in that collection. He says—"From my personal knowledge, as well as from all I can learn, the fossil bones and skull that you refer to are not in our Museum. We have just moved from the old Museum into a larger and more commodious one, and I do not think such specimens could have been overlooked in the removal, if we had possessed them." (May 4, 1863).

But, perhaps, the most interesting collection of mammalian remains made from the ancient forest-bed at Leasowe, was that accumulated with the greatest diligence by Mr. E. T. Higgins, formerly of Birkenhead, and now of Eastington, Gloucestershire. This gentleman constructed an almost entire skeleton of a horse of small size, equaling the Shetland pony in height, and remarkable for the large proportion of the head. In addition to this interesting relic, he had discovered bones of the ox, pig, red deer, roebuck (?), and of a dog, about the size of a greyhound. All these were from the peat; and the sandy bed below he obtained the pectoral defence bone of a species of *Silurus*. It is very much to be regretted that this most interesting series of remains should have been lost to our Museum; but we are sorry to learn that the discoverer of them has parted with them, and that they have been scattered among his friends.

The only other quadruped to be mentioned is the wild boar, of which the only account I have is a notice in Camden's *Britannia* of the discovery of boar's tusks in digging a cellar at Lancaster. Two things must be remarked in connection with this circumstance, viz., first, that the tusks in question were found in company with Roman remains, and might, therefore, very probably have been deposited there by human agency; and secondly, that we ought to expect, on the other hand, to find remains of wild boars, inasmuch as we have positive testimony of their existence in this country in comparatively recent times. Thus, Camden says that "at Low Furnis, the forests abound with deer and wild boars."

This paper would scarcely be complete without the mention of the discovery of a human skull in sandy gravel, about ten feet below the original bed of Wallasey Pool, and in close connection with the ancient fossil oxen before referred to. Here then is the probable contemporary of the great, swift, and strong

Urus, and the short-horned ancestral ox;* here is the eye-witness of the primeval monsters of the British forests, bearing silent testimony to the contemporaneity of man with those vast creatures which his multiplication and increasing dominion have long since exterminated. What scenes of primitive nature in our now densely populated island have the eyes which once filled these sockets beheld ! and could it yet speak, what light would this reasoning, though probably savage, human being cast over the secrets which are so eagerly grasped at by the prying curiosity of the geologist and the antiquary. But the tongue and its unknown language are alike lost, and the vaulted temple of thought, buried for centuries, tells not the secrets of its prison house. But though it lies before us and makes no sign, it is yet full of significance, revealing to us one of those countless links in the chain of human improvement and civilization, upon the vantage of which we *now* stand, and are thus enabled to gaze with an intelligent eye upon the great panorama of the past.

* This skull exhibits a low type, in which the forehead is narrow and low, the frontal ridge prominent, and the occipital portion largely developed. It has been examined by the authors of *Crania Britannica*, who pronounce it to be that of a female advanced in age. The period to which the individual belonged is not determined, but it is probably not so ancient as the stone age. The skull was incrusted with Barnacles and other marine remains, when discovered.

TENTH ORDINARY MEETING.

ROYAL INSTITUTION, March 9th, 1863.

WILLIAM IHNE, PH.D., President, in the Chair.

The Council having invited ladies to this meeting, there was a large attendance.

The PRESIDENT on taking the chair referred to the approaching marriage of the Prince of Wales, to be celebrated the next day, and expressed the loyal wishes of the Society upon the occasion.

Mr. E. J. Reed, chief constructor of her Majesty's navy was elected an Honorary member.

The Rev. Joshua Jones, M.A., and Mr. D. Buxton, M.R.S.L., were balloted for and elected ordinary members.

Mr. HIGGINSON announced that the formal opening of the Gallery of Inventions and Science was fixed for the following morning at ten o'clock.

A paper was then read of which the following is an abstract :

THE HISTORY OF ENGRAVING.

BY THE REV. C. D. GINSBURG, LL.D.

THE art of *chalcography*, or taking impressions from *copper-plate engravings*, is supposed to have been invented in Germany about 1450, and thus to be coeval with the art of printing with moveable types. Some writers of high authority, however, affirm that we are indebted for the origin of this art to the ingenious Florentine sculptor, Maso Finiguerra, who discovered it accidentally.

Pure line engraving is the oldest mode of copper-plate engraving. It is nothing more than drawing elegantly on metal. The design is traced upon the plate, which must be perfectly smooth and polished with a sharp tool called *a dry point* or *etching needle*, and the strokes are cut or ploughed upon the copper with an instrument of an angular form distinguished by the name of *graver* or *burin*. In the first state of the art the lines are comparatively rude, and the value of those productions chiefly consists in the correctness of the drawing. As early specimens of line engraving, when compared with later ones, show the gradual progress of the art, and as the impressions are very rare, they are eagerly sought after and highly prized by collectors.

Like some of us, engraving wisely improved its state by a happy marriage, with the issue of Albert Dürer. This immortal artist invented about 1517 that species of engraving known by the name of *etching*, the process of which is as follows:—The plate is heated upon a stove with a charcoal fire, so that it may not be smoked; a piece of etching ground, which is a composition of virgin wax, asphaltum, Burgundy pitch, &c., incorporated by melting over a fire, and capable of resisting the action of aquafortis, is rolled into the form of a

ball, tied up in a little silk bag, and rubbed over the surface of the plate. The heat of the plate causes the ground to melt and come through the silk on the copper ; then a small dabber made of cotton wool, tied up in a piece of taffety, is quickly dabbed all over the face of the plate while yet warm, in order to make the wax or etching ground which covers it of uniform thickness ; the ground is then held over the smoke of a wax candle to blacken it, and the plate is left to cool ; it is then ready to receive the design. This is traced with a black lead pencil on a piece of thin paper, and laid with its face downwards on the etching ground covering the copper-plate, and then passed through a rolling press, which causes an impression of the outline to be transferred on the smoked ground. The design thus transferred on the etching ground is cut through with etching needles, and the strokes thereby produced are bitten or corroded into the copper with aquafortis. It was the happy union of line engraving with this discovery of Albert Dürer's, which, through skilful treatment, produced the masterly prints of Gerard Audran and others.

Next in point of age is the invention of engraving in *dots*, which was practised about the year 1510. The dots are effected in several ways, and are used either for the whole or certain parts of the engraving. Dots without strokes are executed with the dry point or etching needle, upon etching ground, bitten in with aquafortis, and are afterwards harmonised with the graver, by means of which instrument small dots are made. Sometimes the graver alone is used to express the flesh and the finer parts of the picture. In the print of Domenico Campagnola, about 1570, representing *St. John the Baptist holding a cup, and looking upwards*, the background is expressed by round dots, which appear to have been made with the dry point or etching needle. The outline of the figure is put in with a deeply-graved stroke, finished within with dots, and the hair and the beard are expressed by strokes ; whilst Agostino da Musis,

or Veneziano, pupil of Marco Antonio, expressed the flesh only in dots in several of his pictures. Though the art of copper-plate engraving could now count its great masters by scores in Germany, Holland, France, and Italy, it made its way very slowly to England. As late as the year 1590, there was hardly such a thing to be found as an English copper-plate engraving. Sir John Harrington, in his translation of Ariosto, published in the year 1591, informs us that he "never but once saw pictures cut in brass for any book except his own, and that book was Mr. Broughton's treatise on the Revelations."

Another important style of engraving is that which is distinguished by the appellation *mezzotinto*, invented about the year 1642. It is executed by raising a uniformly dark barb or ground on the plate by means of a toothed tool. The design is then, traced upon the plate, and the bright parts are scraped off with instruments in proportion as the effect may require it. The invention of this style of engraving has commonly been ascribed to Prince Rupert. But whatever may be the doubts about his having originated this style of engraving, there can be no doubt that the honour of having first introduced it into England belongs to the Prince.

The last species of engraving we have to mention is *aquatinta*, which derives its name from its resemblance to water-colour drawing. As in etching, the design is first traced upon etching ground, and afterwards a sort of wash specially prepared for the purpose is laid on by means of aquafortis. By this mode of engraving, which was originally invented by Le Prince, a French artist, about a century ago, drawings in Indian ink, bistre, and other washes are successfully imitated. Such are the different styles of engraving which, as we shall hereafter see, are beautifully adapted by the skilful artist to different subjects. We shall now glance at the development of this art in the different countries in which it was practised.

Though the art of engraving, in the common acceptation of the term, is comparatively modern, not being older than the invention of printing in Europe, yet its progress must not be judged by its age. It grew into a giant almost in its infancy, as may be seen from the productions of the early masters in Italy, Germany, Holland, and France. To enable you to see this, as well as to help you to enter into the peculiarities of style, and the distinguishing features of each school, we shall review some of the works of the most eminent masters, according to their countries, and in chronological order. As Germany is supposed to be the country where prints first made their appearance, we shall begin with it.

Of the earliest masters of Germany, viz., Michael Wolgemut, and Wm. Pleydenwurff, who published, in 1493, the celebrated *Nuremberg Chronicle*, with woodcuts, and of Martin Schoen and Von Mecheln, who engraved on copper, it may be said that their works are more rare and curious than beautiful. Not studying from nature, and not having the advantage possessed by the Italians of being able to refer to the remains of Greek art, the early German artists are defective in drawing; their naked figures are incorrect in the outlines, meagre and emaciated, and look as if a few hearty meals of English roast beef and plum pudding would have done them good.

These were followed by the immortal Albert Dürer, the inventor of etching (1471—1528), who created a new epoch in Germany, both in woodcuts and in line engraving. Few persons are altogether unacquainted with his productions.

So highly were his talents appreciated, that the Emperor Maximilian, who often visited his studio, after gazing with admiration and delight at the print of *The Conversion of St. Eustachius*, ordered that the copper plate should be filled with

gold, anxious, ere its beauties should become faded, to enshrine for ever this wonderful work.

Next in rank are Lucas Cranach (1470-1533), the friend of Luther and Melancthon, who, through the influence which he exercised by his great skill in taking accurate portraits, and in delineating birds and beasts, had numerous imitators ; the brothers Bartel (1496—1550), and Hans Sebald Beham (1500—1555), who studied at Rome under Marc Antonio Raimondi, whose prints are deservedly held in very high estimation and greatly sought after by collectors, and who, together with the renowned Henry Aldegrever (1502—1565), are denominated the *little masters*, on account of their prints being generally small ; and lastly, the brothers David or Daniel (born 1510), and Jerome Hopper (born 1535). These constitute the principal masters of the early German schools of engravers, to whom we may add Melchior Lorich, or Lorch (1527—1586), who engraved both on wood and copper, in a bold, free, and neat style ; and the exquisite etcher, Jonas Umbach (1624—1700), whose works are very spirited.

Passing over the other masters, we come to the renowned James Frey, (1681-1752,) better known by his Italian name Giacomo Frey, who studied in Rome, and who was the founder of a new school in Germany. Few artists have approached nearer the style of the painters from whom they engraved than he. Whilst Frey introduced into the German school the gracefulness of the Italian artists, Justus Chevillet, (born 1729,) who studied under the celebrated George Wille, taught his followers the neatness of the French school. With equal success did James Philip Hackert (1737-1807) labour in the department of etching, as may be seen from many of his prints, which are executed with great fire and spirit. We must conclude this school with the two Müllers, father and son, of whom Germany may justly be proud. The father, (1747-1830,) who only engraved thirty-three plates, immortal-

ised his name by his engraving of the Madonna della Seggiola, which is considered by many a superior print to that of the same subject by Raphael Morghen. The son, Christian Friederich von Müller, (1783-1816,) who surpassed his father, engraved only sixteen plates, owing to the shortness of his career; for he fell a victim to the art he so fondly loved when he was only thirty-three years of age. He was engaged by Rittner, a printseller of Dresden, to engrave the Madonna di San Sisto of Raphael, in the Dresden Gallery, and entered with heart and soul upon the execution of the work, which he finished in a manner worthy of himself and the sublime painter. But when he brought the first proof to his employer, the mercenary man shook his head and told him that he must go over the whole plate again, and retouch it throughout, for that such delicate work would not throw off a sufficient number of impressions to answer the trade purpose. In vain did Müller remonstrate with the £. s. d. man, and he was compelled to rework the plate. At every touch he felt as if his life-blood were departing from him, and that he was sacrificing genius to gain; and by the time he completed his labour he was broken-heated, and died on the very day on which the first proof was taken from the retouched plate. This proof impression which he did not live to see was suspended over the head of his bier as he lay dead, thus reminding the spectators of the similar untimely fate of the great master of the original.

We now come to *the Dutch and Flemish school*, which, though younger by nearly a century than the German, has surpassed it both in the number of artists and the handling of the graver. Lucas van Leyden (1494-1553) the friend of Albert Dürer may be regarded as the father of this school. The fertility of his genius, displayed in the diversity and drapery of his characters, the power and beauty of his composition may be seen in his prints of "*David playing before Saul*" and

"the Great Crucifixion." Passing by the oldest masters, who date from 1510 to 1550, such as Jerome Coek, Adriam Collaeret, Hans Bol, &c., of whose works we have many fair specimens, we notice Cornelius Cort, who went to Italy, resided at Venice in the house of Titian, and there engraved some of his finest works. He afterwards went to Rome, where he established a school, and executed many of the excellent works which are the delight of the judicious collector, and instructed Agostino Caracci in the masterly use of the graver. The galaxy of engravers which appears above the Dutch horizon from this time is almost innumerable.

The Italian school is almost contemporaneous with the German, or, as some will have it, is older than the German school, and in dignity of composition, in unaffected drapery, in simplicity and grace, is superior to all other schools, especially in its early age. This arises from the fact that the Italian artists had the remains of the masterpieces of ancient Greece. The superiority of the drawing of the human figure in this school is moreover to be ascribed to the fact that the Italians drew all their figures in skeleton, then clothed them with flesh, and, lastly, arrayed them in drapery. The oldest specimens of this school which I can show are the prints by Andrea Mantegna, who was born in 1431, and died in 1505.

But no engraver of antiquity deservedly occupies so distinguished a position as Marc Antionio Raimondi (born about 1487.) The correctness of his drawing, the gracefulness and beauty of his figures, and the simplicity and elegance of his execution are unparalleled. See his prints of *Adam and Eve*, the *Martyrdom of St. Felicita*, the *Judgment of Paris*, &c., and it will not be wondered that he should have been the founder of a new school and turned out such eminent disciples as Agostino Veneziano (1496-1540), Marco da Ravenna (born circa 1496), Jacob Caraglio (1512-1570), Julius Bonasoni (1510-1580), Nicolas Beatrice (born about 1500), Enea Vico

(1520-1570), the family of Ghizi, &c. The works of all these pupils are very beautiful and are highly esteemed by collectors.

Though *the French school* is generally considered to commence with John Duvet or Danet (born 1485) or the *Master of the Unicorn* as he is called, from his frequent introduction of that animal in his compositions, yet with the exception of the ingenious Stephen Laulne (1520-1595) we have hardly any master of distinction till we come to the admirable and quaint John Callot (1593-1635), whose prints are very spirited and display great vivacity. He was succeeded by Claude Mellan (1601-1688) who adopted the novel and singular method of working with single parallel lines, without any cross strokes over them, expressing the shadows by making the same lines stronger and near to each other; and by John Morin (1612-1666) who alighted upon that peculiar manner of mixing lines with dots which he so admirably harmonized with each other and employed so successfully in his highly prized portraits. But nothing can surpass or even equal the portraits of Robert Nanteuil (1630-1678). To this period, which may be regarded as the golden age of this art in France, belong Peter von Schuppen of Antwerp (1623-1702) the pupil of Nanteuil, the eminent Anthony Masson (1636-1700), and Gerard Edelinck (1627-1707). A little later appeared the two Drevets, father (1664-1739) and son (1697-1739). Specimens of the works of these artists, as well as of those of the inimitable John James Balechou (1715-1764) and John George Wille are indispensable to the formation of a collection. Without these it is impossible to form a correct notion of the development of the art of engraving in France.

The English school. During the time that the German, Dutch and Italian schools were making marvellous strides towards perfection, there was a solitary copper-plate engraver in England of the name of Thomas Geminus, who executed in 1545 the frontispiece to *Vesalius's Anatomy*. Remigius

Hozenberg (flo. 1550), the family of Passe, Wenceslaus Hollar (1607-1677) and other foreign artists were engaged in all the fine work in our country. The proper English school of engraving commences with the eminent William Faithorne (1620-1691). Between him and the celebrated William Hogarth (1697-1764) there is hardly any artist worth mentioning, and indeed we have no engraver of distinction till we come to the famous Robert Strange (1721-1792) and William Woolett (1735-1785), the one distinguished for subjects, and the other for landscapes. To these must be added John Smith (flo. 1720), Valentine Green (1739-1813) and Richard Earlom (died in 1822), who stand pre-eminent as mezzotinto engravers, as well as William Sharp (1749-1824) one of the three most celebrated English line engravers, the other two being Strange and Woolett. The merits of Sharpe may be judged of from the following anecdote. When at Rome he visited the famous Raphael Morghen who was then very old. The Italian engraver exhibited to the English artist various masterpieces, and in accordance with the old custom, reserved the best wine for the last. Before finishing, Morghen exclaimed—"And now, Mr. Sharp, I will show you a print which is equal to anything I ever did in my life," and then produced Sharp's own engraving of *The Doctors of the Church after Guido*. It needs hardly be said that Sharp felt highly flattered and delighted with this compliment, and when, after returning to England, he related this story, he added, with a vanity not altogether inexcusable, "And indeed the old man was not far from right."

ELEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, March 23rd, 1863.

WILLIAM IHNE, Ph.D., President, in the Chair.

The Council having invited the attendance of ladies, there was a large meeting.

The Rev. G. C. Page, Mr. R. D. Jones, (Collegiate Institution) and Mr. Archibald Roxburgh, were balloted for and elected ordinary members.

Mr. MOORE exhibited some marine animals of the genera *Salpa*, *Porpita*, &c., collected in a voyage from China by Captain Baker, of the ship "Niphon," who was proposed as an Associate of the Society.

Mr. MOORE also exhibited under the microscope some newly-hatched ova of the great lake trout, from Switzerland.

Dr. COLLINGWOOD called attention to the fineness of the equinoctial week, with reference to a pamphlet published in April last, by Mr. Du Boulay, in which the writer called upon his readers to verify his data for predicting a wet summer for last year. The truth of this prediction was verified, and the same principles should indicate a very fine summer during the present year.

A communication with reference to the paper of the President on English Grammar, was then made, as follows:—

OTHER, EITHER, OR, WHETHER.

By J. A. PICTON, F.S.A.

THESE words, whether used as pronouns or conjunctions, have a very close connexion with each other, and from the loose and confused manner in which they are employed and substituted for each other in the early stages of our language, their examination and analysis is attended with some difficulty.

For a philological inquirer into the etymology of the Aryan tongues, there is no rest for the sole of his foot, until he has hunted down a word, through all its Protean forms, back to its Sanskrit radical.

Adopting this course, we find the original prototype of “*other*” in the Sanskrit *antara*, bearing the same signification. It is a compound term formed by the pronominal root *an*, which indicates individuality, and is identical with the Greek *ἐν* and the Latin *un-us*, also with the German *ein*, English “*an*,” or “*one*.” The other syllable “*tar*” or “*tara*,” signifies to step beyond, to place beyond, and is the original root of the second degree of comparison in most of the European languages. *Antara*, therefore, signifies the thing separated. With this correspond the

<i>Gothic</i>	Anthar
<i>Old German</i>	Andar
<i>Modern German</i>	Andere
<i>Swedish</i>	Andre
	Annan
<i>Old Norse</i>	Annar
<i>Danish</i>	Anden
<i>Dutch</i>	Ander

In Latin the letter *l* corresponds to the *n* in Sanskrit and it becomes “*alter*.” In Greek the *n* is omitted, and it becomes in the Doric dialect *ἄτερος*, in the Attic *ἐτερος*.

In Old Saxon, Anglo-Saxon, and Old Frisian, the *n* is also omitted, and the word takes the form of *ather* and *other*, the *th* of the Low German and the *d* in the High German representing the dental *t* of the Sanskrit.

The adjectival form in Sanskrit is *anya*, which is represented by the

<i>Greek</i>	ἄλλος for ἄλιος
<i>Latin</i>	Alius
<i>Gothic</i>	Aljis
<i>Anglo-Saxon</i>	Elles
<i>English</i>	Else

The sense of *each* is expressed in Sanskrit by the same particle prefixed—*anudinam*, each day; or by doubling the word—*ekaikah*, each one, *anyonyam*, each other.

Whether is descended from the Gothic *hwathai*, and means, literally, which separated thing, being compounded of the pronoun *was* (Sanskrit *kas*), and the separative or comparative particle *ter* or *ther*.

Either has a double descent. As a pronoun it comes from the Anglo-Saxon *æghwæther* contracted to *ægther*, signifying sometimes *both*, and sometimes *either* in the modern sense. *Either* as a conjunction is descended from Anglo-Saxon *oththe*, Gothic *aitthau*, German *oder*, and corresponds with the Greek *ἢ*; see Matthew vi, 24, xii, 33. *Or* is merely a contraction of *either*, for the sake of euphony.

In our old writers there is much confusion in the employment of these particles (Anglo-Saxon, Mark ii, 8, iii, 4, Luke vi, 8), Wickliffe uses the word *outher*—“No man may serve to two lordis; for to the *outher* he schal hate the toon and love the tother, *outher* he schal susteyne the toon and dispise the tother.” Robert of Gloucester uses “other” as equivalent to “or”—

“And there nas of olde house in the land non,
That he ne amendyde myd som land *other* myd byldinge,
Other myd boe, *other* ryche cloth, *other* ryche thyngē.”

He also uses *or*—

“*Other* he smote of the arm, *or* the hond, *or* the heved.”

There can be little doubt that the words *either*, *other*, *whether*, had originally a dual relation, implying a comparison between two things only. Thus, in Sanskrit, *anyatara* means either of two, *anyatama*, one out of many. See Bopp I, 376. In the word *other* this dual sense has been entirely lost, but it appears still to linger in our use of *either* and *whether*.

A paper was then read of which the following is an abstract:

THE ARCH OF TITUS.

By HENRY DUCKWORTH, F.L.S., F.G.S., &c.

ON the highest point of the Via Sacra, and at the foot of the Palatine Hill, stands one of the most interesting relics of Ancient Rome—one of the most remarkable monuments in the world.

Those who are acquainted with its exposed position must have marvelled that any trace of it should exist at all—but the Arch of Titus had too wonderful a story to tell, to have been permitted to disappear utterly from the face of the earth.

The Senate and people anxious to record the glorious deeds of the conqueror of Judæa, resolved to erect and dedicate to him a triumphal arch, and hence arose the simple and elegant pile of which such considerable remains have been preserved to us in spite of the strifes and turmoils of eighteen centuries.

It is reasonable to suppose that this monument was commenced during the lifetime of Titus, but as we shall presently see, it was certainly not completed until after his death.

The site selected for the arch was the ridge of the Velia, the highest ground in the Via Sacra, and hence termed by the ancients the “*Summa Sacra Via*.” A finer and more commanding position could not well have been chosen, for on one side stood the Flavian Amphitheatre, or Colosseum; on the other, the Capitol and the Roman Forum.

Independently of historical associations, the Arch of Titus possesses much interest as a work of art, from its being one of the earliest examples of the Composite order with which we are acquainted. Some writers, indeed, have instanced it as the earliest known specimen of its class; but, as Barton correctly observes, the Temple of Augustus and Rome, at Melazzo, in Caria, has an indubitable claim to priority.

Unlike most structures of a similar class, erected at subsequent periods of the empire, the Arch of Titus has only one opening, a carriage-way, and hence it appears somewhat heavy when compared with the arches of Constantine and Septimius Severus, which have in addition two smaller sideways for foot-passengers.

The Arch of Titus is one of the smallest in Rome, its height not exceeding fifty feet, and its breadth forty-five feet. The stone employed in its construction was a beautiful white marble—but what remains of it is naturally much stained and blackened by age. Both façades appear to have been precisely similar, each being ornamented with two pairs of fluted composite columns, each pair resting on a single base, and having between them fenestral panels, instead of the bassi reliefs usually placed there.

The frieze, a considerable portion of which still exists on the front of the arch facing the Colosseum, represents some of the ceremonies connected with the apotheosis or deification of Titus. A procession of sacrificing priests, and oxen, and the effigy of the emperor reclining on a couch borne by four men, are still plainly distinguishable, and perhaps they were still more so in the time of Donati, who makes special mention of this interesting feature in his learned treatise “*Roma vetus et recens*,” written upwards of two hundred years ago.

The final act of the apotheosis is represented in the centre of the vault of the arch, where Titus is seen seated on the eagle of Olympus, which, with outstretched wings seems soaring to the stars. This bas-relief is somewhat inferior in point of execution, and, although the likeness of the emperor is apparently well preserved, there is a coarseness about the whole work that leaves an unfavorable impression upon the mind.

The sides of the archway are lined with the celebrated bas-reliefs, representing the finale of the procession of Titus to

the Capitol with the spoils from Jerusalem. These sculptures, which rank among the best specimens of Roman art extant, are executed in marble, and are twelve feet eight inches in length, and about seven feet seven inches in height.

The principal figure on the north-east side, i.e., the side on our right hand as we look towards the Capitol, is Titus himself, standing in a magnificent triumphal car drawn by four high-stepping steeds. The artist thus corroborates the statement of Josephus, that Vespasian and his son triumphed in separate chariots—at the same time it is worthy of note, that Orosius distinctly states, that they rode together in the same car,—a sight, he adds, perfectly novel to the Romans. I would not lay too much stress on the evidence afforded by the sculpture, for the arch being in honour of Titus alone, it is not likely that the artist would represent the incident otherwise than he has done.

The emperor who is attired in an ample toga, holds in his left hand the imperial sceptre, the greater part of which is now broken off—and the right hand no doubt grasped a bough of laurel, as was used on such occasions—no trace of this exists however, and the hand and a portion of the forepart of the arm are wanting.

On the occasion of a triumph it was customary for a public slave to stand behind the Imperator, and to hold over his head a golden Etruscan crown, decorated with jewels, in order to avert *invidia* and the influence of the evil eye. The slave is here replaced by a figure of Victory, with outstretched wings, and above the now shattered head of Titus may be discerned the remains of the laurel chaplet which she holds in her right hand. In her left hand she formerly bore, according to Donati, an Idumæan palm-bough, but no trace of this exists now, and the lower part of the arm is also wanting. The horses are led by a noble female figure, emblematical of Rome, and who regards with veneration and pride the occu-

pant of the quadriga. Her head is helmeted and in her right hand she bears a spear. As it is one of the most prominent, this is also one of the most mutilated in the whole series. The rest of the ground is occupied by four Lictors, bearing their proper insignia; and the fasces and laurel-crowned brows of the remaining eight appear above the heads of the horses and in front of the triumphal car.

The sculptures on the opposite side of the archway represent the principal spoils from the Temple of Jerusalem. The procession is represented as entering a triumphal arch, which is the first object on the extreme right. Next are seen eight laurel-crowned men, who bear upon their shoulders a ferculum, on which is placed the table of shew-bread, with its two acerræ or incense vessels, and the two silver trumpets resting cross-ways beneath it, on the narrow belt or border that connected the four legs (Exod. xxv, 25); whilst before them is carried a signum, which perhaps bore an inscription explanatory of their nature and history.

This group is immediately succeeded by another one carrying the candlestick in a similar manner on a ferculum, and preceded also by the descriptive signum.

The rich and massive cornice supported a somewhat heavy attic, in which were set very large and plain votive tablets. That on the south-east front, and which is almost entirely perfect, bears the following simple inscription, the letters of which were of bronze, sunk into the stone:—

SENATVS
POPVLVSQVE · ROMANVS
DIVO · TITO · DIVI · VESPASIANI · F
VESPASIANO · AVGVSTO

It is natural to suppose that an inscribed tablet formerly existed on the north-west attic, but no trace of it remains at the present day. According to Panvinius, Faunus, and other archæologists of the 16th century, a votive tablet, which was

discovered in their day, was believed to be the one in question. It is much to be regretted that this interesting relic was not preserved, as doubts have been entertained whether it ever had any connection with the arch of Titus—some writers contending that it originally stood over the principal entrance of the Circus Maximus; and it is worthy of remark that, whilst it was commonly described as having been found in the Forum, Martianus states that it was dug up in the Circus. “Hujus victoriæ fidem facit marmor quod in Cireo in nostris temporibus fecit efforsum.” (*Urbis Romæ Topographia*, cap. iii, lib. iii.)

The inscription upon this tablet is said to have run thus:—

S.P.Q.R.

IMP . TITO . CAES . DIVI . VESPASIANI . FILIO
 VESPASIANO . AVG . PONT . MAX . TR . POT . X
 IMP . XVII . COS . XIII . P . P . PRINCIPI . SVO . QVI
 PRAECEPTIS . PATRIS . CONSILIISQ . ET
 AVSPICIIS . GENTEM . IVDAEORVM . DOMVIT
 ET . VRBEM . HIEROSOLYMAM . OMNIBVS . ANTE
 SE . DVCIBVS . REGIBVS . GENTIBVS . AVT . FRVSTRA
 PETITAM . AVT . INTENTATAM . DELEVIT

This inscription would thus appear to have been executed A.D. 81, and during the lifetime of Titus, for the epithet “divus” is not applied to him here; and hence it is not improbable that the arch was completed at that date, with the exception of the sculptures on the frieze, the apotheosis in the vault, and the extant inscription on the south-east attic. Nardini (*Roma vetus*, lib. iii, cap. xiii.), referring to the missing inscription, remarks—“In hac Divi nomen non legitur, unde et vivo Tito arcum positum confidere est;” and further—“Existimemus igitur vel arcum hunc vivente Tito inchoatum verum ob breve illius imperii tempus nondum absolutum fuisse, vel uti Anjelonius in Historiâ Augusta de hoc ipso agens Tito censet Divi titulum seu cognomen vivis

quoque non-nunquam Imperatoribus tribui solitum." But both Angelonus and Nardini seem altogether to overlook the representations of the emperor's consecration on the upper part of the arch, and which of themselves are a sufficient proof that he must have been deceased at the time of their execution.

Whilst antique representations of several of the Roman triumphal arches have been preserved to us, in the form of medals and cameos, we have none of the arch of Titus; which is to be regretted, as we are thereby unable to determine in what manner the upper part was finished. We may reasonably presume, however that it was ornamented with a bronze quadriga, such as we see represented in the commemoration coins of the arches of Drusus and Septimius Severus.

TWELFTH ORDINARY MEETING.

ROYAL INSTITUTION, April 20th, 1863.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

Mr. D. Marples was balloted for and duly elected an ordinary member.

Captain F. E. Baker, of the ship *Niphon*, was balloted for, and elected an Associate, on the recommendation of the Council.

Ladies had been invited to this meeting, and there was a numerous attendance.

The following paper was read:—

ON A
NEW THEORY OF THE GENERATION OF STEAM ;
WITH AN
EXPLANATION OF THE GEYSERS OF ICELAND.

By E. J. REED, Esq., M.I.N.A. ;

Chief Constructor of Her Majesty's Navy ;

Hon. Member of the Literary and Philosophical Society of Liverpool.

IN venturing to address you this evening upon a new theory of the generation of steam, I cannot help feeling that some of you may be disposed to consider me unduly bold. The mere putting forward of a new theory upon such a subject may in itself be considered an act of temerity ; and that I, who am almost a stranger among you, should presume to propound it here, may at first sight be thought an aggravation of the offence. I have grounds, however, for asking you to lay your censure upon me lightly ; for, in the first place, the theory which I have to propound to you, although new, is by no means deficient of numerous and strong corroborations, several of which will be made manifest to you this evening ; and, in the second place, it is no theory of my own, but is the result of experimental investigations that have been carried on for a series of years by a very distinguished townsman of yours, whose labours have tended largely not only to distinguish Liverpool in the world of science, but also to benefit it greatly in a commercial sense, by the establishment, so early as the year 1823, of steam trading vessels running between Liverpool and Dublin. I allude to my venerable friend, Mr. Charles Wye Williams.

Those of us who have been accustomed to scientific studies must oftentimes have felt, I think, that even the standard works of our language are deficient and contradictory in their representations concerning the generation of steam or vapour. It is impossible, in fact, to employ these words—"steam" and "vapour" *—without feeling the necessity of having their meanings more definitely fixed and limited in works of science; for hitherto some philosophers have used them indifferently, considering them synonymous; while others have been at some pains to draw distinctions between them. Dr. Thomson, for example, is careful to explain that water *evaporates* into vapour and *vaporizes* into steam. In his *Introduction to Meteorology*, he says:—

"Evaporation differs from vaporization in the amount of heat required for its production. Water *vaporizes* when it passes into *steam* at a temperature of 212° ; below that temperature it *evaporates*, passing into the ambient air in insensible moisture."

A distinguished man of science, writing in the *Encyclopaedia Britannica*, states exactly the contrary of this, for he says:—

"*Evaporation*, in natural philosophy, is that process by which water and other liquids are converted into *steam*, an elastic fluid, and dissipated in the atmosphere."

In Main and Brown's work on *The Marine Steam Engine*—a work of authority, "designed chiefly for the use of the officers of Her Majesty's Navy"—we are carried back to Dr. Thomson's views, for the authors say:—

"To distinguish vapour from steam, vapour is formed only at the surface: steam from the body of the liquid. Evaporation proceeds at all temperatures. *Steam* is formed when the fluid has arrived at a certain fixed temperature [212°]. The formation of *steam* is a violent process; the formation of *vapour* is gradual and insensible."

Dr. Whewell, however, in entire disregard of these fanciful distinctions, as I think I may call them, freely employs the

* Throughout this discussion the word "vapour" must be supposed to stand for "vapour of water"—other vapours not being under consideration here.

word “steam” as strictly synonymous with the “aqueous vapour” of the atmosphere. In his *Bridgewater Treatise*, for example, he says :—

“ Alternations of fair weather and showers appear to be much more favorable to vegetable and animal life than any uniform course of weather could have been. To produce this variety we have two antagonistic forces by the struggle of which such changes occur. *Steam* and air, two transparent and elastic fluids, expansible by heat, are in many respects and properties very like each other; yet the same heat similarly applied to the globe produces at the surface currents of these fluids tending in opposite directions. And these currents mix and balance, conspire and interfere, so that our trees and fields have alternately water and sunshine, &c.”

Here, then, we have at the very outset, contradictions enough to embarrass any student; and it would be easy to multiply them largely if need were. But we have already encountered, as you may have observed, another confusion of terms. The words “vaporization” and “evaporation” have had peculiar meanings attached to them. According to Dr. Thomson, to vaporize means to convert into steam, and to evaporate means to convert into vapour; but according to the *Encyclopaedia Britannica*, to evaporate means to convert into steam; while Turner, the eminent chemist, makes the word “ebullition” take the place of Dr. Thomson’s “vaporization,” and then gives one meaning to all the three words apparently, for he says :—

“ Evaporation, as well as ebullition, consists in the formation of vapour, and the only assignable difference between them is, that the one takes place quietly, the other with the appearance of boiling.”

Now as a first step towards giving soundness, consistency and unity to our knowledge of this subject, Mr. Williams sweeps away all this jumble of competing and conflicting phrases, and gives to each of the words “vaporization,” “evaporation” and “ebullition” its distinct and legitimate signification. The structure of each word defines what that

signification is. *Vaporization* (as applied to water) is clearly the conversion of water into vapour by means of heat; *evaporation* is as clearly the escape of vapour from water; and *ebullition* is that particular mode of evaporation which arises from the aggregation of the vapour into bubbles before and during its escape from the water. The distinction between the *generation* of vapour, and "its mere *escape* into the air, would appear so self-evident," says Mr. Williams, in his lately published work *On Heat in its Relations to Water and Steam.**—a work to which I shall have occasion to refer very often this evening, and in which the author's views are fully and luminously set forth, "that it is the more extraordinary there should be any doubt on the subject, or any room for inaccuracy in describing their respective peculiarities. Nothing, however, is more common, even among writers of the highest authority, than to find the terms *vaporization* and *evaporation* not merely confounded and used as if they were synonymous, but actually reversed, and thus so misplaced as to lead to serious practical errors." We have already seen the truth of this statement; and I do not think there can be a single doubt in any mind that the definite meanings which Mr. Williams assigns to the words *vaporization*, *evaporation* and *ebullition* are just and proper, or that their uniform restriction to those senses would be of extreme service to science.

To the words "vapour" and "steam," he also assigns a definite meaning—the same meaning for both; and from what I have seen of the writings of Dr. Dalton, Dr. Whewell and other authors of the highest standing, there is full sanction for his doing so. Dalton expressly says that "vapour exists at all times in the atmosphere, and is *one and the same as steam*, or vapour at 212° and upwards." Among engineers it has been a habit, I know, to keep up a great distinction between the nature

of ordinary vapour and that of steam, owing no doubt to the little occasion they have to consider the gaseous product of water and heat in any other than its more condensed and potent manifestations. But it is impossible to expatiate largely among the writings of chemists and of meteorologists without discovering that this great distinction is, after all, but imaginary, and that in their view, at any rate, steam and vapour are, as Dalton says, identical in character, the fiercest jet of steam being, in fact, nothing more or less than a compact stream of the self-same vapour that rises daily like incense from flower, and field, and sea, and floats in such beauty and splendour above us, that an inspired writer was constrained to ask, “Dost thou know the balancing of the clouds, the wonderful works of Him who is perfect in knowledge ?”

But however consistent with some of the writings of great scientific authorities it may be to assume that there is no substantial difference between vapour and steam, and that the only difference is one of quantity, the author of our new theory has had not a few assertions of a contrary nature and of much weight to contend with. For, strange to say, most of our philosophers, when they have come to study and treat of steam generation, seem to have forgotten altogether those phenomena of vaporization and evaporation with which we are all perfectly familiar in daily life, and of which they themselves have given most brilliant expositions. It seems to be universally admitted by scientific writers that whenever an ocean, a river, a lake, or a body of water of any kind, is exposed to some degree of natural warmth, no matter how low the degree may be, the conversion of a portion of that water into vapour, and the speedy escape of that vapour into the air, invariably follow. So readily do this vaporization and evaporation take place, that we not unfrequently find the process designated “spontaneous evaporation.” and repre-

sented as occurring "at all temperatures," no matter how inferior they be. Yet, no sooner do these philosophers begin to discourse to us of the application of artificial heat to water, than all remembrance of these obvious facts seems to die out, and we are told that the effect of the heat is (no longer to vaporise the water, but) to expand the heated portions of the fluid, which then rise to the surface, being succeeded below by other cooler portions thereof, and that thus a continued circulation of the fluid is kept up by a series of ascending and descending currents, until the whole body of it has been brought into contact with the source of heat and raised to 212° F., whereupon the generation of steam is commenced and continued as long as the heat is applied, or as any portion of the water remains. It would occupy a volume to explain in what diversified forms, and with what variety of so-called experimental illustration, this theory has been repeated in standard works of science. So firm a hold has it taken of the scientific world, that for my part I never heard it questioned in the slightest degree until I had the good fortune to make the acquaintance of my friend Mr. Williams, and to follow him through a course of reasoning and of experiment which had convinced him that it was invalid and inconsistent with facts.

And, on the very face of it, it does certainly seem remarkable that this theory of the mere heating and expanding effect of artificial heat applied to water should have been so implicitly accepted by us, when we remember that it takes no account whatever of a phenomenon which forces itself unceasingly upon the attention of every civilised person, viz.: the escape of copious volumes of steam or vapour from what is commonly called hot water. It may be true that this phenomenon has been reflected upon by many, and it is not improbable that those who have reflected upon it have found ways of reconciling it in their own minds, in some superficial

manner, with the current theory ; but a very little quantitative experimentation is sufficient to show that no theory can be satisfactory that does not provide a very considerable place for the phenomenon in question.

It is scarcely possible to enter, however superficially, upon an experimental inquiry into this subject without speedily encountering, as Mr. Williams has shown, proofs of the fact that in art, as in nature, the generation of vapour is, to say the least, a very early consequence of the application of heat to water. Take a champagne glass, and pour into it some cold water, allowing the glass to stand upon the table as you do so ; upon the top of the glass place a glass saucer, and into that also pour a little cold water ; let them alone, and they will remain, for a time at least, as they are. But take up the champagne glass in your warm hand, clasping it therein as completely as possible, and you will soon find a vapour rise from the water within it, and deposit itself in the form of mist upon the glass saucer, which is speedily obscured by it. The mere heat withdrawn from your hand will suffice to generate a visible and tangible body of vapour. Or vary the experiment, and perform it after the manner of one of Mr. Williams's earliest illustrations. Take a flat-bottomed glass vessel capable of holding 6 or 8 pounds of water. Pour in as much water of the temperature of the surrounding air as will cover the bottom, and on the top of the vessel lay a glass saucer containing cold water as before. Now simply stand the glass vessel on a piece of hot flannel, and almost instantaneously vapour will rise, fill the glass, and be condensed on the saucer above. Again, instead of placing the glass vessel in this last case upon hot flannel, suspend it upon a holder above a spirit lamp or a gas jet, and the selfsame result will follow.

Here then we are shown, by experiments of a most simple and unquestionable nature, that a very early, in fact an in-

stantaneous, effect of applying artificial heat to water, is the generation of vapour. Whether the heat heats the water as water, or expands it as water, or not, it indubitably converts a portion of the water into vapour; and as men of sense and of science we are bound to demand that this fact be recognised by every theorist, and admitted into every theory that is put forward upon the subject. In the physical world phenomena of precisely the same kind, play most important and astonishing parts. The weight of the atmosphere has been computed at above 4,000,000,000,000,000 of tons; and the aqueous portion of it, which is constantly undergoing partial alternate condensation and vaporization, is supposed to vary from 1-100th to 1-20th of the whole; so that an ocean of vapour weighing never less than, say, 40,000,000,000,000 tons is suspended above us, and although subject continually to condensation on hills and mountains, and in a hundred other ways, yet is no less continually maintained at this enormous proportion by the silent process of natural vaporization. We talk of our steam power, and we are told that the product of our British coal mines is so great that we might derive from them annually an amount of power equivalent to that of an army of 5,000,000 of fresh men. But even if this power were all realized by the agency of steam, how far short would it not fall of that immeasurable energy thus silently exerted by the vaporising action of the sun upon land and sea? Nor is this wondrous agency less beneficent than powerful. In an article published only this month by the eloquent Herschel* we are told, what we otherwise know, that "Professor Tyndall has recently shown that it is entirely to the moisture existing in the air that our atmosphere owes its power of confining and cherishing as it were the heat which is always endeavouring to radiate away from the earth's surface into space. Pure

* See "The Sun," by Sir J. F. W. Herschel, Bart., in *Good Words*, for April, 1863.

air is perfectly transparent to terrestrial heat, so that, but for the moisture present in the atmosphere, every night would place the earth's surface as it were in contact with that intense cold which we are certain exists in empty space No animal or vegetable could resist such a frost for an hour, any more than it could live for an hour in boiling water." We all know, also, how the aqueous vapour of the atmosphere tempers the sun's beams in torrid climes, and by its fluctuations assists in fanning the tropical coasts with land and sea breezes, and by its ascent and descent performs that magnificent meteorological paradox which the comprehensive eye of King Solomon discerned when he exclaimed, "All the rivers run into the sea, yet the sea is not full; into the place from whence the rivers came, thither they return again."*

When the subject first came under my notice, Mr. Williams drew my attention to the fact that in the experiments which I have just recited, the rise of the generated vapour, and its diffusion through the superior liquid, were plainly visible to the eye under certain optical circumstances—a discovery which seems to have escaped all previous experimenters, and to have been reserved as a great reward for the scientific ardour and fidelity of my excellent friend. It was with no small pleasure, I assure you, that I first witnessed this simple but most beautiful phenomenon. Instead of ascending and descending currents, as described by all previous writers, we have a continuous movement *upwards* of cloud-like vapour. It occurred to me to ask if it were not practicable to exhibit this phenomenon artificially, and on a large scale, by the use of some special optical appliances. I found that Mr. Williams had anticipated me in the idea, and had applied to an experienced optician for suitable apparatus. Unhappily the attempt at that time failed. I am delighted to tell you, however, that success has since been achieved; and I have

* Ecclesiastes, i. 7.

now the very great pleasure of inviting your attention to an experiment which I am pretty sure will be successful, because it has been most kindly undertaken by my very accomplished and distinguished scientific friend, Dr. Edwards. You will observe that almost as soon as the heat of the lamp is applied to the bottom of the glass vessel containing water a copious and continuous flow of cloud-like vapour ascends through the fluid, and escapes into the air. Here then we have visibly demonstrated a most important feature of Mr. Williams's theory, viz.: that the consequence of applying heat to water is not to heat and expand that water—or, at any rate, not solely to heat and expand it—but to generate volumes of steam or vapour.

It may, however, occur to some persons that it is just possible that these visible forms and movements are not really proofs of an actual conversion of water into vapour, but merely optical effects resulting from that upward movement of portions of water which, in accordance with the ordinary theory, are heated below and ascend to the surface. A little reflection will suffice, however, to convince you that this is not the case. In the first place, the promptness with which these cloud-like forms are produced, the speed with which they rise, the quickness with which they succeed each other, and above all the great expansion (both vertical and *lateral*) which they undergo—all these conditions of the phenomenon render the conjecture in question extremely improbable, not to say impossible. But more than this. If these visible effects were produced by actual elevations of volumes of *water*, and if the body of water experimented upon had had suspended in it solid substances of a specific gravity very closely approximating to unity—that is to say, if it had contained substances which, being of just about the same weight as water, bulk for bulk, would float in equilibrium in any part of the fluid—then these substances (such as bran or

amber, for example,) would of necessity have been disturbed by the upward passage of these currents of expanded water. With the apparatus before us, however, we can show you that this effect would not have taken place. We can show you floating substances suspended with the utmost delicacy—that is to say, with their gravity most exactly balanced by their buoyancy—and which are therefore free to rise and fall in perfect obedience to a liquid current, and yet they remain at rest while these visible currents flow past and over them most freely and copiously. They are not, therefore, currents of water, but currents of a far lighter and finer fluid rising through the water—currents, in short, of extremely thin vapour or steam. By applying heat very rapidly or very intensely at one spot, it is quite possible, of course, to produce disturbances among these floating substances ; but that it is equally possible to avoid this effect by a more gradual application is sufficient proof, I think, that these beautiful expanding and ascending cloud-like forms are of a less substantial fluid than that upon whose waves the mighty navies of the world are tossed like toys. But the best of all proofs that this is vapour, and not water that we see, is presented to us in the fact, that on reaching the surface it escapes from the water, and rises through the air in clouds which need no special optical circumstances or apparatus to make them visible.

From the facts now before us we are well entitled to draw several important inferences.

The first inference is, that the statement which is so confidently and so frequently put forward concerning the formation of vapour or steam at the *surface* of water only, is wholly erroneous. Messrs. Main and Brown, as we have seen, while admitting that what they call “ steam ” is formed in the body of the liquid, maintain that “ vapour ” is formed at the surface only. Dr. Lardner implies the same thing when he says :—“ When a liquid boils, vapour is formed in every part of its

dimensions, and more particularly in those parts which are nearest the source of heat; but liquids *generate vapour* from their *surfaces* at all temperatures."

It would be easy to multiply statements of this kind to a very large extent, but it is not necessary to do so. It must be well known to you that the doctrine in question is a very common one. But we have been taught by the experiments that you have witnessed that it is untrue. The vapour is manifestly formed, as we had a perfect right to anticipate, at the place where the heat is applied, wherever that may be.

The next inference to be drawn is that water, even when of a low temperature, does not condense steam or vapour, —that is, does not re-convert it into water. This is a doctrine so contrary to widely received opinions that one can hardly expect you to sanction it with readiness. But have we not seen, in the experiments of this evening, the steam which has been formed at the bottom of the several vessels of water rise up uncondensed through the superincumbent body of liquid, and escape as steam at the surface? If cold water can condense steam at all, why has it not condensed these small and feeble streams long before they have reached the surface—as soon, in fact, as they have been generated? The circumstances were the most favourable for condensation that can be imagined. The water was cold, the steam* extremely small in quantity, and the intermixture of the two perfect; yet the vapour came forth as vapour, and rose into the air as if to render all further doubt of its immunity from condensation by the parent liquid absolutely unquestionable!

Further, on looking at the subject thoughtfully, you will speedily discover that if water (or, to say the least, water of such temperatures as we have been dealing with) had the power of condensing the vapour, it would be impossible for the vapour which we have seen ever to have been formed at

* In accordance with what I have previously stated, I am here employing the words "steam" and "vapour" synonymously.—E. J. R.

all within the body of the liquid. For the condensation of vapour must manifestly consist in the abstraction of heat from it, and the heat abstracted must of course be supposed to combine with the condensing water. But we have previously seen that when heat is imparted to water, the earliest effect (or say one of the earliest effects) is to convert that water into vapour. So that, according to the hypothesis here under notice, one aqueous particle or set of particles would require to possess a greater affinity for heat than another particle or set of particles—a supposition which is in the last degree improbable, and which after all would not get rid of the vapour for us.

The next inference is therefore, that water is capable of containing, and when what is called warm or hot, in common parlance, does contain, an amount of uncondensed vapour or steam. Mr. Williams, in his work before referred to, has recorded the results of many beautiful experiments illustrative of this doctrine; but you will perhaps excuse me if I show you one which I myself proposed some time ago expressly to test the truth of it. It occurred to me that, if it be true that water has no power of condensing steam, but is capable of containing large quantities of the latter uncondensed, it would be easy to accumulate a visible volume of it in a body of water considerably below what is called the boiling point. I accordingly took a glass vessel containing a few pounds of water out of which the air that usually pervades water had been driven, and into this vessel and this water I lowered a glass saucer, inverting it after it was immersed, and provided supports which kept it a little up from the bottom of the containing vessel in order that the water might be perfectly free to circulate all around it, if it were disposed to do so. I then applied heat to the bottom of the containing glass vessel, and after a short time a bubble of steam began to accumulate beneath the saucer. Long before 212° was indicated by ther-

mometers immersed in the liquid about and below the saucer—before even 200° was reached—this volume of steam accumulated sufficiently to exert a pressure which lifted the saucer up and allowed it to escape, and to rise up through the superincumbent water into the air above.

It would be easy to shew you this experiment, but I have devised a modified form of it, in which the effect is rendered more visible, and which I will now exhibit to you. I have here such a glass vessel containing water as I have described ; and I have here a smaller glass vessel to which I have attached an iron ring that is intended to act as a sort of anchor. This smaller vessel will take the place of the saucer before mentioned, and the anchor will have the effect of keeping the small immersed vessel always upright, with the steam within it. With this arrangement, you see that while the water is considerably below boiling point, steam accumulates in the small vessel until, on a sufficient quantity being collected, that vessel is lifted up by its pressure, and its cable so to speak is put in tension. Having waited a while, we now see the upward pressure is sufficiently increased (owing to the further accumulation of steam) to “trip the anchor”—to use a nautical phrase ; after another short period, the anchor is now “weighed,” and finally the vessel, anchor and all, is, as you see, carried bodily upward to the surface. On protruding into the atmosphere, the glass is cooled down, a portion of the steam within it becomes condensed by the cool glass, and the whole descends again to the bottom. By applying the heat still longer, those various movements are repeated and thus an opportunity is afforded you not only of seeing a volume of steam immersed in comparatively cool water, but also of witnessing a series of mechanical operations, which require a considerable exertion of force, actually performed by the body of steam so circumstanced.

In order to demonstrate even more conclusively, if possible,

the inability of water of comparatively low temperatures to condense steam, I suggested another experiment, which it is perfectly impossible, I believe, to gainsay. I fitted up a glass funnel to take the place of the inner glass vessel mentioned in the last experiment, with the bulb of a thermometer in its interior, the graduated stem of the thermometer passing up steam-tight through the stem of the funnel. Performing the experiment as before, the volume of steam was accumulated in the upper portion of the vessel, immediately above the bulb of the thermometer, and, on withdrawing the heating lamp, there the steam remained in absolute contact with water which the thermometer plainly showed to be of less than 200° ; in fact, the thermometric indication falls as low as 150° , and even lower still, before the bubble of steam disappears.

I do not think it possible, in the face of experiments like these, to doubt that the common theory urgently demands revision.

It now becomes necessary to explain what philosophical grounds we have, independent of the before-mentioned experiments, for believing that steam or vapour is formed by the application of heat even in extremely small quantities, to water; and on what principles its prompt diffusion through the body of water may be accounted for.

Without accepting the atomic theory of matter as a demonstrated philosophical truth, but receiving it, with Dr. Whewell, as an admissible "mode of expressing and calculating laws of nature," we may consider gases as each consisting of some ponderable base united with some repellent agent, such as heat (and perhaps with some other elements which we agree to term imponderable fluids); for, as Dr. Faraday says, "when we speak of the gaseous state as being due to the mutual repulsion of the particles, or of their atmospheres, although we may err in imagining each particle to be a little nucleus to an atmosphere of heat, or electricity, or any other agent, we

are still not likely to be in error in considering the elasticity as dependent on mutuality of action." Now we know that vapour consists of what we may call a base, composed of combined oxygen and hydrogen, invested, by means of heat, with this elastic character; and that its particles do exert among each other that "mutuality of action" of which Dr. Faraday speaks with confidence—the action being, as we know, essentially and invariably repellent. In fact we have Dalton's own authority for saying that "vapour cannot, on any scientific principle, be classed in a distinct category from elastic fluids, retaining its elasticity and repulsive power among its own particles." Further, we know, from abundant experience, that the conversion of *water*, the particles of which attract each other so strenuously, into *vapour* whose particles repel each other no less strenuously, is effected by extremely small quantities of heat. We know that the mere heat of the atmosphere produces in plants an amount of vaporization and evaporation which is one of the great means by which their crude fluids become inspissated and altered in their nature, and by which the life of the plants is thus maintained. We know also that the moderate heat of the human body is sufficient to vaporize the liquids that escape through the delicate sudoriferous ducts of the skin, and that this vaporizing process is essential to the healthy action of the human mechanism. We know further that it is by a vaporizing process carried on at comparatively low temperatures that the mighty mass of aerial vapour, to which I have previously referred, is uplifted from land and sea, and made to conform to the beneficent purposes of the author of the universe. It is then a departure—a singular and extreme departure—from what we know to be going on all around us, to suppose that increments of heat, however small, will not convert proportionate quantities of water into steam, and it is for the maintainers of the ordinary doctrine of steam generation to show

on what grounds they commit such a departure from widely recognised principles as to assume that a temperature of 212° is essential to its formation.

We see, therefore, that apart altogether from the special experiments which we have before considered, we have good philosophical grounds for assuming that the effect of applying artificial heat to water is at once to generate a volume of steam. We have next to inquire what we must philosophically expect to become of the steam so generated—an inquiry that need cause us but little trouble. That doctrine of the mutuality of repellent action among the atoms of gases with which we are now familiar, indicates to us at once that this steam will expand and diffuse itself throughout the interior of the containing vessel. If the vessel be closed the steam will (unless cooled down) remain thus diffused throughout it; if open, it will, of course, go on expanding out into the atmosphere. The complete diffusion will take place, and the vapour will pervade the whole vessel as effectually as if the water were not there. This fact is well known to have been distinctly laid down by Dalton in respect of gases. "Gases mechanically mixed with water," he says, "retain their elasticity or repulsive power amongst their own particles just the same in water as out of it, the intervening water having no other influence, in this respect, than a mere vacuum." When we conjoin with this statement his previous one—viz., that vapour cannot be considered different to other elastic fluids as regards elasticity and repulsive power—we see how closely this great master of science approached to the theory which I am bringing to your notice. It does not appear, however, that Dalton ever grasped the full purport of these doctrines. It has been reserved to Mr. Williams to consummate the labours of his predecessor, and to establish in all its simplicity and beauty the theory that the vapour of water, like any other gas, is free to diffuse itself through water of all temper-

atures, and that it is not annihilated by the parent fluid, as has heretofore been supposed.

And it may not be amiss to state in this connection that there is a peculiar fitness in the circumstance of this discovery proceeding from my venerable friend. Mr. Williams was in early life, and before Dalton announced his discoveries, a pupil of the celebrated William Higgins, of Dublin, whom Davy acknowledged to be the first discoverer of the modern form of the atomic theory. From the lips of Higgins he listened to the earliest enunciation of that theory, and later in life, not only became an earnest student of Dalton's writings, but delivered at Manchester a lecture treating largely of gaseous diffusion, at which Dalton himself presided, and which received the full approbation of that illustrious man. It is in the steps of Dalton that Mr. Williams has, in this matter, been content to tread, as he has emphatically stated more than once. In his work before referred to,* he quotes the sentence of Dalton which I last cited and adds, "This is all that is here contended for. This is literally true when vapour is mixed with water. Its denial would but again raise the question whether vapour was or was not an elastic fluid," —which Dalton himself distinctly says it is, as we have seen. I should not do justice, however, to my own deep sense of the nature of Mr. Williams's labours if I did not clearly state that his researches are very much more than completions of Dalton's inquiries into certain physical problems. Mr. Williams' work opens up, and casts a brilliant light into many questions which Dalton does not appear to have investigated at all; and although I do not consider the work altogether free from blemishes, it is, in my judgment, a most splendid contribution to modern science.

And this leads me to speak of a class of phenomena to which but little attention has hitherto been given; concern-

* C. W. Williams "On Heat in its Relations to Water and Steam." Longman and Co., London; Webb, Liverpool.

ing which Mr. Williams has made several remarkable discoveries ; and which is, in my opinion, inexplicable under any other theory than that which he has laid down. I allude to the ebullition excited by the introduction of foreign substances into masses of water to which considerable heat has been applied. The treatment of this part of the subject will necessarily involve a discussion of what is denominated by philosophers "the boiling point" of water.

The following words, extracted from Dr. D. B. Reid's *Elements of Chemistry*, contains a somewhat succinct, and yet sufficiently explicit, statement of the received doctrine concerning this subject :—

"At 212° boiling water produces steam, having barely sufficient elasticity to overcome the pressure of the air, and rise against it. Water does not attain a higher temperature under ordinary circumstances, as the steam then escapes, carrying along with it all the excess of heat communicated to the water."

Professor Gmelin, in treating of this question, says :—

"Since elasticity increases with the temperature, there exists for each body a certain temperature at which the elasticity of its vapour is a balance for the pressure of the atmosphere, and consequently cannot be restrained by that pressure. This temperature is the boiling point of the body. At this point it passes into vapour in spite of the atmospheric pressure, as soon as the additional heat required to volatilize it is supplied."

That variations occur in the temperature of the boiling point under changes of atmospheric pressure, and certain other circumstances, is generally acknowledged. Sir Robert Kane, for example, says that water boils in a glass or porcelain vessel under a pressure of 30 inches of mercury (the ordinary atmospheric pressure), not at 212° , but at 214° ; and he goes on to say, that in graduating a thermometer it is necessary to use metallic vessels, for the metal "appears to favour ebullition by the minute irregularities of its surface affording a nucleus for steam to form." If the smooth surface of the glass, he

adds, be removed in a single point by a scratch with a diamond "the bubbles of steam will be seen to form *there* before the general mass of the liquid begins to boil." Professor Miller states that the adhesion of the fluid to the surface of the vessel containing it, "has a marked effect in raising the boiling point," in consequence of which, he adds, "water sometimes boils at 214° , if a pinch of metallic filings be dropped in." It is also stated by him and by some other authors that the expulsion of air from water elevates the boiling point very considerably—so considerably that the temperature and pressure sometimes rise sufficiently high without producing boiling to convert the ebullition, when it does take place, into a powerful explosion. Professor Brande reasserts that the adhesion of the fluid elevates the boiling point. He says:—

"The influence of the quality of the surface of the vessel, its cleanliness and other circumstances, upon the boiling point of water has been examined by F. Marcell. He found that in glass flasks the boiling point varied with the quality of the glass, fluctuating between 100° and 102° of the centigrade scale [212° and 215.6° Fahrenheit]. If the glass vessel be perfectly cleared by solution of potassa, or by sulphuric acid, and all chemical and mechanical matter removed, water may be raised in it, without boiling, to 105° C. [221° F.] In all these cases the degree of adhesion between the water and its containing vessel appears to be the cause of the fluctuation at which boiling ensues."

In the *Treatise on Heat*, by Professor Dixon, of Trinity College, Dublin, we read:—

"This subject has been examined with particular care by M. Magnus and M. Donny, and we propose to lay before the student the views of these writers on the process of ebullition. M. Magnus remarked, what had been observed by previous physicists, that water which has been well boiled does not generally pass into the form of a steam in glass vessels until it has acquired a temperature considerably above that due to the force of its vapour, and that the formation of steam then takes place suddenly and with great violence. From this it follows that the force requisite for the disengagement of the

steam is greater than its expansive force subsequently, and the difference of these forces, M. Magnus refers to the attraction of cohesion existing between the particles of the liquid, which requires to be overcome at the moment of formation of the steam, in addition to those pressures which the vapour itself subsequently sustains. . . . Accordingly, sawdust or insoluble powders, diffused through the fluid mass, and the sides of a metallic vessel, which, as is well known, are never completely moistened at all points by water, lower the temperature of ebullition to that of vapour."

In Professor Faraday's *Chemical Manipulations* the effect which the introduction of foreign substances has upon the process of ebullition—and which we have already seen incidentally and somewhat ambiguously mentioned by Professor Miller—is noticed at some length. The author says:—

"The evolution of vapour is in many cases much facilitated by the addition of substances having apparently no chemical action; and the process of distillation is not only thus facilitated, but rendered possible and easy in cases where otherwise it would be almost unattainable. If diluted alcohol, spirits of wine, or certain alcoholic solutions be distilled in glass vessels, the vapour is frequently evolved with difficulty; the contents of the retort at one moment not boiling at all, and at another bursting throughout into a mass of vapour and fluid, which fills the whole body of the vessel. This endangers the sudden expulsion of part of the substance, causing serious derangement of the process, and is also accompanied with such agitation of the fluid—such bumping and shaking of the retort—as at times actually to endanger the safety of the whole; for when the vapour is formed, it is with such force as to produce a dull explosion. This is prevented by the introduction of a few angular or fragmented pieces of solid matter into the retort, of such nature as not to be acted upon by any of the substances present."

Now, if these passages are carefully examined, it will be seen that one doctrine pervades the whole of them, and is in most instances as distinctly expressed as it is possible for language to express it. That doctrine is, that at a certain temperature, which may be varied within given limits, and which is known as the boiling point, water to which successive

increments of heat have been applied *begins* to be converted into steam. In other words, that steam is not formed during the heating process until the boiling point has been attained. Dr. Reid plainly says that it is at 212° (and by implication not below that), that water "produces steam." Professor Gmelin no less plainly says, that at the boiling point the water "passes into vapour." Sir Robert Kane clearly implies that at 212° in metallic vessels, and at 214° in glass or porcelain vessels, the opportunity is afforded for "steam to form." In the statement of M. Magnus's views given by Professor Dixon, we read of water "passing into the form of steam," and of the "formation of steam" taking place "suddenly and with great violence." And in Professor Faraday's more practical remarks we read of the contents of a retort in a moment "bursting throughout into a mass of vapour and fluid;" and also of vapour being "*formed* with such force as to produce a dull explosion."

If we turn from these citations, and from the received opinions which they express, to the theory of Mr. Williams which is now before us, we shall find, I think, much of the mystery and confusion of this apparently intricate subject vanish. According to this theory, when heat is applied to water, steam is formed, and goes on accumulating in the liquid from the moment the heating process commences. If the containing vessel be open to the atmosphere, part of the steam so formed will of course escape from the surface; but under ordinary circumstances, the escape will not be sufficiently rapid to provide for the exit of all the newly-formed steam, and the latter will therefore go on accumulating, as I have said, in the liquid. After awhile this accumulation will become so great as to thoroughly to saturate the liquid; or, in other words, to fill it with as much steam as it can contain under its existing circumstances, or under the forces to which it happens to be subject. From that moment, the whole of the steam subse-

quently formed, or its equivalent in quantity, will, if ebullition be favoured, urge its way out of the liquid, with more or less violence according to its quantity and to its facility of exit. But, let it now be observed that while the imprisoning or restraining forces—the atmospheric pressure, and the molecular cohesive forces of the liquid—may, for a single experiment, be considered constant (*i. e.* invariable in amount), or nearly so, the expulsive forces impressed upon the steam may be varied in many ways. It is highly probable, for example, that the gaseous forces are either partly or wholly thermo-electric; and that the pressure of roughened surfaces, or of foreign substances, in the body of, or in contact with, the vapour, may therefore exert an important influence upon it. They may, for instance, exert an attractive or aggregative influence, and consequently cause the diffused vapour to rush towards them. This rushing together of the gaseous particles would favour the formation of bubbles; and no sooner would bubbles be formed than the liquid pressures would exert upward forces upon them, and expel them summarily at the surface. In this way, then, it is easy to see that the period at which ebullition, or the violent escape of steam in the form of bubbles, commences, may be varied by varying the character either of the surface of the vessel containing the liquid to be heated, or by immersing in, or extracting from the liquid, solid impurities; and in this way the term “boiling point” may have a definite meaning affixed to it, and its observed variations be satisfactorily accounted for.

We are now in a position, I think, to understand what Mr. Williams states as the “cardinal facts” of this branch of his theory, viz.:—

“1st. That ebullition, or the formation of bubbles, is nothing but the sudden aggregation or grouping of myriads of atoms of vapour *already formed* and existing *in the liquid mass*, and rushing into contact with some motes or points of foreign matter, accidentally or intentionally presented to them.

“ 2nd. That these aggregates are composed exclusively of such vapour atoms as are in excess of the saturating quantity.

“ 3rd. That the quantity of vapour required for the saturation of any liquid has a fixed relation on the one hand to its density, and on the other, to the repellent action which its constituent atoms individually exercise, whether the liquid medium be water, ether, alcohol, oil, or mercury.

“ 4th. That ebullition has no relation to the quantity or number of liquid atoms converted into vapour atoms, from any given surface, but to the number of such atoms that may have been enabled to form such groupings or aggregates.

“ 5th. That without those groupings or aggregates, the vapour atoms, as they are successively formed, would individually rise, though invisible (by virtue of their separate enlarged volumes and diminished specific gravity), to the surface, and from that surface into the air.”

The experimental facts which Mr. Williams adduces in support of these views, and the whole of which I have repeatedly verified by experiments of my own, are extremely interesting and significant. If we take a glass flask or bottle containing clear well-distilled water, and freed from all foreign matter by filtration, with a perfectly clean thermometer inserted in it, and apply heat gradually until a temperature of, say, 215° has been attained, we shall find that no commotion, or motion of any kind, will thus far be produced in the water. But now dip for a moment into the water the end of a fine rod, or the tip of a feather, and instantaneously a violent commotion and a voluminous discharge of steam will take place around it. Withdraw the rod or feather, and lower a minute piece of brick, or coal, or any other such substance into the water, and that, no less instantaneously, becomes a centre of agitation, and of copious ebullition. Withdraw it, and plunge a rod or stick well down into the body of the water, and straightway a most violent and abundant discharge of steam will occur, and if the rod or stick be held there for a second or two only, the discharge will lower the temperature to 212° or thereabouts, and the agitation will subside. If, after these experiments, a

small loose solid mote or two is found to have been left behind, then, if the application of the heat is still continued, it will be seen that every such mote becomes a centre of local ebullition, and, move about as it may, carries with it the power of collecting the steam in globules, which ascend in a continuous stream to the surface of the liquid.

Now the question is whether the feather, the rod, the fragment of brick or coal, and the motes employed in these experiments, are the occasions of steam being *generated* in the instantaneous manner described, or merely the occasions for steam already generated to discharge itself? It is just possible perhaps, to conceive of water, as water, resisting the vaporizing action of heat up to a certain point, and then undergoing a sudden and violent transformation into steam when subjected to the action (of whatever nature that action may be) of these foreign bodies. But so far as I am aware we know nothing that can justify us in assuming the existence of any such state of things; on the contrary we know perfectly well that the application of heat to the water in these very experiments has converted much of it into steam, part of that steam having escaped, and part having remained in the water; and with the evidence now before us, it seems exceedingly probable that by the time a temperature of 212° is attained, a complete saturation of the body of liquid by the steam, has been effected. If this be so, then, when the exalted thermo-electric condition of the mass of steam is considered, we may well expect, I think, to find it rushing into globules and bubbles the moment a foreign body of a wholly different kind is introduced. This explanation of the experimental phenomena in question appears to me to be a far more feasible one than any that I can frame in conformity with the commonly-received doctrine. I believe, with Mr. Williams, that "we have no alternative but the conclusion that the rod or other body introduced has merely acted the part of a nucleus

of attraction for the vapour generated over the entire bottom surface of the vessel."

I will only add the following summary of the principles laid down by Mr. Williams :—

" 1st. That water, or its atoms, can neither be *heated* nor *expanded*, and still retain the character of liquidity.

" 2nd. That the prevailing theories as regards *ebullition*, are altogether erroneous.

" 3rd. That the so called *boiling point*, as regards temperature, is merely that point at which the water is charged with vapour *to saturation*, under the true Daltonian theory, the water acting the part of a mere *vacuum or medium*.

" 4th. That we have strong grounds for believing that there is no difference between the *cause* which produces divergence and mutual repulsion among the atoms of a liquid on becoming vapour, and that which produces a similar divergence and repulsion in the pith-balls or gold leaves of the electroscope.

" 5th. That if there be such a thing as *Thermo-Electricity*, we are warranted in concluding that it acts, in the same way, and on a similar principle, on atoms of a liquid as on those of other bodies.

" 6th. That we have rational grounds for believing that *explosions* in steam-boilers are frequently the result of the accumulated steam (present in the body of the water) being suddenly released by the removal of the pressure from the *denser* medium of the water into the *lighter* one of the air.*

" 7th. That Watt's theory of steam being *condensed*, and reconverted into the liquid state, by the direct action of cold water, is altogether erroneous.

" 8th. That vapour or steam cannot give out its heat to water, and is but mixed, *mechanically*, with it, on the true Daltonian theory."

Such then are some of the leading discoveries and conclusions which we owe to Mr. Williams, and I feel confident

* This theory of explosions (which contrasts so strongly with that which has lately obtained the greatest currency—that of explosions resulting always from deficiency of water) deserves, in my opinion, very serious attention. In his work already referred to, Mr. Williams furnishes facts which singularly corroborate it.—E. J. R.

that, even while laying aside all that personal regard which his long and honourable residence among you must have excited in your minds, you will agree with me in believing that, as students and lovers of science, we must heartily admire both the zeal and the genius which he has brought to bear upon this profound and intricate subject. It is a subject in connection with which great successes have been achieved, and great reputations made; but when I compare the confused and conflicting doctrines enunciated in our existing works, with the clear and harmonious principles now presented to us in his recent writings, I cannot help thinking that the name of Mr. Williams deserves, and will ere long attain, a place as high and as illustrious as those of even the most distinguished discoverers in this beautiful and profound branch of science.

It only remains for me to add a few words on the perfect manner in which this new theory accounts for the phenomena of the Geysers of Iceland. These have, of late years, been made so familiar to all by books of travel, and in other ways, that I need not describe them at length. They may briefly be said to consist of more or less violent discharges of steam and what is called boiling water from subterranean sourses, each through an upright tube, which opens out above into a capacious basin. In accounting for these hot springs, the existence of subterranean heat is, of course, always assumed; but opinion has been greatly divided as to the *modus operandi* of its application. One class of writers, of whom Sir George Mackenzie may be taken as the representative, considers that sudden evolutions of heat occur: that these have the effect of generating volumes of steam, which accumulate in cavities with sufficient pressure to sustain the column of water in the Geyser tube; and that further sudden accessions of heat and steam produce vertical oscillations in this column of water, during which the steam finds opportunity to escape, and carries up with it a great part of the water. Another class

of writers have adopted a theory put forward by Bunsen, in which the Geyser tube alone, without a subterranean cavern, is supposed to contain water, heat being applied to the tube itself, and the relief of pressure which results from the elevation of the upper portion of the water playing an important part in the operation. In this case, however, as in the former, the notion of steam being *suddenly* generated is preserved, heated rocks being supposed to furnish the necessary supply of local heat.

Now, Mr. Williams's theory most amply and beautifully accounts for all the phenomena of these Geysers, without assuming the existence either of intense local heat, or of sudden evolutions of heat. Simply assuming the existence of a subterranean heat of some kind—and all now admit the existence of that—also the presence of water in and below the tube, and, in his view, the generation and accumulation of steam must take place. As the quantity of this steam goes on increasing, the moment will arrive when the saturation of the water will have taken place, and after that a more or less violent discharge of steam must follow. It seems reasonable to suppose that the Geyser tube is not an isolated reservoir, and that it opens into wells or springs below of greater or less extent; and in this way the enormous amount of the discharges that issue from these Geysers may be accounted for, whereas, the tube alone seems of wholly insufficient capacity to supply them.

I would now ask you to observe the apparatus which we have here, and which Mr. Williams himself constructed. It consists simply of a tube opening into a vessel of water below, and a basin above, the tube and lower vessel being filled with water which rises up and partly fills the basin. Heat is now applied below; steam is, as we think, accumulating in the water; now you hear explosive sounds and observe commotion in the fluid; and now a violent and copious

discharge of steam and water bursts, Geyser-like, from the basin. The action now subsides ; the water returns from the basin down the tube to the reservoir below ; and presently all these phenomena will repeat themselves, just as they do in nature. The Geyser, then, like the miniature working model before us, consists of a large reservoir below, a single tube or orifice of exit, and a basin above which receives a large portion of the ejected water, to be returned to the reservoir below. This reservoir being necessarily full of water, the steam generated must remain and accumulate in it until the point of saturation has been reached, which will depend on the height of the column of water in the vertical tube of exit, the temperature in the reservoir corresponding with that elevation. In the miniature that temperature is found to be 215° when the discharge takes place. In the Geyser, this must be considerably higher, the tube of exit being there 47 feet. We thus see that the Geyser and its miniature correspond in action and result.

THIRTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, May 4th, 1863.

WILLIAM IHNE, PH.D., PRESIDENT, in the Chair.

Messrs. James Lister, and Francis J. Bailey, M.R.C.S., were balloted for and elected ordinary members.

It was announced that the Council had decided upon holding the annual dinner of the Society some time during the month of May; and that the arrangements, which were in the hands of a sub-committee, would be duly announced to the members.

Dr. COLLINGWOOD stated that he had received from a correspondent in Scotland, a *Doris*, bearing a close resemblance to the *Doris planata* of Messrs. Alder and Hancock, but without its flat planarian form. He had submitted it to Mr. Alder, and he read a letter from that gentleman, who was greatly interested with the specimen, which corroborated his belief that the specimen figured in their work was an immature individual of the *Doris testudinaria* of Risso, of which the English *Doris planata* must henceforth be regarded as a synonym.

Mr. PICTON inquired whether any remarks on the paper, "On a new theory of Steam," read at the previous meeting, would be in order.

The CHAIRMAN replied, that usually no discussion took place on papers previously read; but as so little time had been allowed after the reading of the paper at the last meeting, he would not object.

Mr. PICTON then proceeded:—The paper in question professed to propound a new theory as to the nature and genera-

tion of steam. The new points were stated to be these—that steam and vapour are identical in their nature and laws; that steam is developed at all temperatures; that it is not generated, as usually supposed, at the time of its development, but exists in a free state in the substance of the water, varying in pressure with the temperature; that water in heating does not expand and circulate, as is usually supposed; that cold water does not condense steam, but absorbs or dissolves it. The first statement, that steam and vapour are identical, is no new discovery at all, but has been recognised from the time of James Watt, who himself investigated the subject, and delegated it to Southern and Creighton, who made a series of experiments on steam at all pressures from 4-10ths of an inch mercurial pressure up to 240 inches. Dr. Dalton, in 1793, published the results of similar experiments. Bétan-court, in France, soon after published tables of pressure at various temperatures, from 32 deg. Fahrenheit, to 279 deg. Arago, Regnault, and various other scientific men have pursued similar enquiries. The following laws, which are true of steam, as of all other gaseous substances, at all temperatures, may be met with in most treatises on steam:—(1) with a constant temperature, the pressure varies simply as the density, or inversely as the volume; (2) with a constant pressure, expansion is uniform under a uniform accession of heat at the rate of $\frac{1}{31}$ part of the volume for each degree; (3) with a constant volume or density, the increase of pressure is uniform at the rate of $\frac{1}{31}$ part of the pressure for each degree of temperature acquired. The existence of steam diffused in water in a free state was anything but proved by the experiments submitted. The clouded appearance of the water, as seen by the oxy-hydrogen light, was simply due to the varying density owing to the partial change of temperature. The phenomena of the irregular outburst of the Geyser in Iceland had been explained by Professor Bunsen on

true scientific principles. Water, after being long subjected to heat, loses much of the air contained in it, has the cohesion of its molecules much increased, and requires a higher temperature to cause ebullition ; at which moment the production of steam becomes so great and instantaneous as to cause explosion. The introduction of stones or foreign matter, by disturbing the water, materially aids this operation. The water of the Geysers constantly increases in temperature up to the moment of explosion, having been found as high as 261 deg. Fahrenheit, being equal to a steam pressure of two and a half atmospheres, or 36lbs. to the square inch. On the whole, Mr. Williams's theory was by no means proved either by the experiments or the reasoning adduced.

Dr. EDWARDS, in reply to Mr. Picton, recapitulated some of the principal novel points of Mr. Reed's paper, which he considered to be a fair exposition of the views of Mr. C. Wye Williams. He said, that had time and opportunity permitted, he should have been glad to have followed Mr. Picton's criticisms *seriatim*, as he thought they might all be met. But he should better consult his own feelings and their patience by stating, in a very few words, what he considered to be the novel and important point which Mr. Williams' experiments established, viz., that water possesses an extraordinary solvent power in regard to its own vapour. This assertion need not surprise us, for the solvent powers of water upon various substances greatly exceed those of other liquids. In reference to solids, such as salt, sugar, and gum, the examples are very familiar to us ; but in reference to gases and vapours, this power is less popularly known, but is not less real and general. Some gases, such as Chlorine, Hydrochloric acid, and Ammonia, are dissolved by water at ordinary temperatures to the extent of from 30 to 40 per cent., but this aëriform matter, although held in solution, is liable to be readily withdrawn, either slowly or suddenly, by mechanical

changes in the liquid. The effect of surcharging a liquid with gaseous matter is seen upon withdrawing the cork from a bottle of champagne or soda-water. The amount of gas dissolved at a given temperature by water varies greatly in different cases, but Mr. Williams leads us to believe, that the greatest solvent power of water is exerted upon its own vapour, and that in an increasing ratio up to a temperature of 212° to 218° Fahrenheit, when, being super-saturated, the phenomenon of ebullition occurs. Mr. Williams combats the idea frequently reiterated in works upon Steam that steam is "annihilated" when condensed in water—and Dr. Edwards had had repeated opportunities in Mr. Williams' laboratory of confirming this view. Experiments of this nature may be "illustrated" in the public lecture-room, but not "*proved*." Gentlemen who were disposed to study the question more closely, would be well repaid by a patient repetition of the experiments detailed in Mr. Williams' book, and he should be very glad to offer members of the Society such facilities as his laboratory would afford for studying the phenomena of steam in water, in greater detail. He was convinced that Mr. Williams had corrected many fallacies, and opened a valuable field of investigation, which would well repay the cultivation of practical and scientific engineers.

The following Paper was then read :—

THE ESSENES.

BY THE REV. CHRISTIAN D. GINSBURG, LL.D.

I.

IT is very surprising that the Essenes, whose exemplary virtues elicited the unbounded admiration of even the Greeks and Romans, and whose doctrines and practices contributed so materially to the spread of Christianity, should be so little known among intelligent Christians. The current information upon this remarkable sect or order of Judaism, to be found in ecclesiastical histories and Cyclopædias, is derived from the short notices of Philo, Pliny, Josephus, Solinus, Porphyry, Eusebius, and Epiphanius. These seven witnesses—of whom the first and third are Jewish philosophers, the second, fourth and fifth heathen writers, and the last two Christian church historians—are all who, till within a very recent period, have been subpœnaed before the tribunal of public opinion, to give evidence as to the character of these very much misunderstood and neglected Essenes.

Not only is this combined testimony insufficient, but it is too much tainted with the peculiar dogmas of the respective witnesses, to furnish the general reader with an unbiassed notion of the character and doctrines of this ancient sect. Philo and Josephus, writing in Greek and in apology for their Jewish brethren, were too anxious to represent to the Greeks and Romans every phase and sect of Judaism, as corresponding to the different systems of Greek and Roman philosophy; Pliny, Solinus, and Porphyry, again, betray too great an ignorance of the inward workings of the Jewish religion, and too much prejudice against the Jews; whilst Epiphanius draws upon his imagination, and Eusebius simply copies the account of Philo, with the well-known patristic pen. Nor can the

modern descriptions of the Essenes, as given in the histories of the church and in the popular Cyclopædias, be always relied upon when they profess to give the results of the afore-mentioned garbled scraps of ancient information ; since the writers are either too much afraid of, or too much pleased with, the marked resemblance between some of the doctrines and practices of Christianity and Essenism. Hence those who style themselves the true evangelical Christians are very anxious to destroy every appearance of affinity between Essenism and Christianity, lest it should be said that the one gave rise to the other ; whilst those who are termed Rationalists multiply and magnify every feature of resemblance, in order to show that Christianity is nothing but a development of Essenism—so that the poor Essenes are crucified between the two.

The design of this essay is to give an impartial statement of the doctrines and practices of the Essenes ; to show their rise and progress, their relationship both to Judaism and Christianity, their numbers and localities, to trace the most probable signification of their name, &c., &c. To do this, I not only appeal to the seven stereotyped witnesses, but to the information upon this subject scattered throughout the Midrashim and the Talmud. But not to incur the charge of partiality, as well as to enable you to test my conclusions, I have collected all that the ancients have written upon this subject, and append to this paper the whole account which Philo, Pliny, Josephus, Solinus, Porphyry, Eusebius, and Epiphanius give of the Essenes.

The cardinal doctrines and practices of this sect are as follows :—They regarded the inspired Law of God with the utmost veneration. In fact, their adhesion to it was such that they were led thereby to pay the greatest homage to Moses, the lawgiver, and to visit with capital punishment any one of the brotherhood who blasphemed his name. The

highest aim of their life was to become the temples of the Holy Ghost, when they could prophesy, perform miraculous cures, and, like Elias, be the forerunners of the Messiah. This they regarded as the last stage of perfection, which could only be reached by gradual growth in holiness, brought about through strictly observing the commandments and the Levitical laws of purity contained in the Pentateuch, mortifying the flesh and the lusts thereof, and being meek and lowly in spirit, inasmuch as this would bring them into closer communion with him who is the Holy One of Israel. This earnest desire to avoid everything which involved profanity in the slightest degree and which might interpose between them and the Deity, made them abstain from using oaths, because they regarded the invocation, in swearing, of heaven or the heavenly throne, or anything which represents God's glory, as a desecration. Their communication was yea, yea ; nay, nay ; whatsoever was more than these came of evil.

Their increased strictness in enforcing the observance of the rigid Mosaic laws of Levitical purity, which were afterwards amplified and rendered still more rigid by traditional explanations,¹ ultimately compelled the Essenes to withdraw

1 According to tradition there were four degrees of purity. 1. The ordinary purity required of every worshipper in the temple (*טהרה חולין*). 2. The higher degree of purity necessary for eating of the heave-offering (*טהרה הרכמה*). 3. The still higher degree requisite for partaking of the sacrifices (*טהרה הקורב*). And 4. The degree of purity required of those who sprinkle the water absolving from sin (*טהרה חטאה*). Each degree of purity required a greater separation from the impurities described in Leviticus xi, 24—xv, 28. These impure subjects were termed the *fathers of impurity* ; that which was touched by them was designated the *first generation of impurity* ; what was touched by this again, was called the *second generation of impurity* ; and so on. Now, heave-offerings—the second degree of holiness—became impure when touched by the *third generation* ; the flesh of sacrifices—the third degree of holiness—when coming in contact with the *fourth generation* ; and so on. These degrees of purity had even to be separated from each other ; because the lower degree was, in respect to the higher one, regarded as impure, and any one who lived according to a higher degree of purity became impure by touching one who lived according to a lower degree, and could only regain his purity by lustrations (*טבילה*). The first degree was obligatory upon every one, the other grades were voluntary. Before partaking of the heave-offering, the washing of hands was required ; and before eating of the flesh of sacrifices, immersion of the whole body was required —*Comp. Babylonian Talmud, Tract Chagiga, 18 b.*

themselves altogether from the society of their Jewish brethren, to form a separate community, and to live apart from the world, since contact with any one who did not practice these laws, or with anything belonging to such an one, rendered them impure. This fear of coming in contact with that which is impure, as well as the desire not to be hindered in their spiritual communion with their Creator, also made the Essenes abstain from marriage; inasmuch as women, according to the law, are subject to perpetual pollutions in menstruum and child-birth (compare Lev. xii, 1—8; xv, 19—31), and as going to one's wife, even under ordinary circumstances, is regarded as defiling (*vide infra*, p. 215, note 19). There were, however, some weak brethren who could not be like the angels in heaven, neither marrying nor being given in marriage; these were allowed to take wives, but they could never advance to the highest orders of the brotherhood, and had, moreover, to observe laws specially enacted for married brethren and sisters.

Here, in their separation from the Jewish nation, whatever any one of them possessed was deposited in the general treasury, from which the wants of the whole community alike were supplied by stewards appointed by the whole brotherhood; so that they had all things in common. There were no distinctions amongst them, such as rich and poor, masters and servants; they called no one master upon earth, but all ministered to the wants of one another. They lived peaceably with all men, reprobated slavery and war, and would not even manufacture any martial instruments whatever, however great the temptation or the fear might be. They were governed by a president, who was elected by the whole body, and who also acted as the judge of the community. Trials were conducted by juries, composed, not as our juries are, of twelve persons, but of the majority of the community, or of at least a hundred members, who had to be unanimous in their verdict.

The brother who was found guilty of walking disorderly was excommunicated, yet was he not regarded as an enemy, but was admonished as a brother, and received back after due repentance.

As it was contrary to the laws of Levitical purity to buy anything from one who did not practice those laws, the Essenes had to raise the supplies of all their wants among themselves. In this they experienced no difficulty, as their food and raiment were most simple and very self-denying, and as each one of the community willingly took his share of work in the department in which he most excelled. Some were engaged in tilling the ground, some in tending flocks and rearing bees, some in preparing food, some in making the articles of dress, some in healing the sick, and some in instructing the young ; whilst all of them devoted certain hours to studying the mysteries of nature and revelation and of the celestial hierarchy. They always got up before the sun rose, and never talked about any worldly matters till they had all assembled together and, with their faces turned towards the sun, offered up their national hymn of praise (המְאֵר לְאָרֶץ) for the renewal of the light of the day. This done, every one betook himself to his work, according to the directions of the overseers, and remained at it till the fifth hour (or eleven o'clock, a.m.), when the labour of the forenoon regularly terminated. All of them again assembled together, had a baptism in cold water, put on their white garments, the symbol of purity, and then made their way to the refectory, which they entered with as much solemnity as if it were the temple. The meal was a common one ; and each member took his seat according to the order of age. Those of the brethren who were the bakers and cooks then placed before each one a little loaf of bread and a dish of the most simple food, consisting chiefly of vegetables as they ate very little animal flesh, and the repast commenced after the priest had invoked God's

blessing upon it. A mysterious silence was observed during the meal, which had the character of a sacrament, and may have been designed as a substitute for the sacrifices which they refused to offer in the temple. The priest concluded it by offering thanks to the Bountiful Supplier of all our wants, which was the signal of dismissal. Hereupon all withdrew, put off their white and sacred garments, and dressed themselves in their working clothes, resumed their several employments which they had to do according to the directions of the overseers till the evening, when they assembled again to partake of a common meal. But though every thing was done under the directions of the overseers, and the Essenes had even to receive their presents through the stewards, yet in two things they were at perfect liberty to act as they pleased, viz., they could relieve the distressed with as much money as they thought proper, and manifest their compassion for those who were not of the brotherhood as much as they liked, and whenever they liked. Such was their manner of life during the week days.

The Sabbath they observed with the utmost rigour, and regarded even the removal of a vessel as labour, and a desecration of this holy day. On this day they took special care not to be guilty of forsaking the assembling of themselves together, as the manner of some is. Ten persons constituted a complete and legal number for divine worship in the synagogue, and in the presence of such an assembly an Essene would never spit, nor would he at any time spit to his right hand. In the synagogue, as at meals, each one took his seat according to age, in becoming attire. They had no ordained ministers, whose exclusive right it was to conduct the service; any one that liked took up the Bible and read it, whilst another, who had much experience in spiritual matters, expounded what was read. The distinctive ordinances of the brotherhood, as well as the mysteries connected with the Tetragrammaton

and the angelic worlds were the prominent topics of Sabbatic instruction. Every investigation into the causes of the phenomena both of mind and matter was strictly forbidden, because the study of logic and metaphysics was regarded as injurious to a devotional life.

Celibacy being the rule of Essenism, the ranks of the brotherhood had to be filled up by recruits from the Jewish community at large. They preferred taking children, whom they educated most carefully and taught the practices of the order, believing that of such the kingdom of heaven is best made up. Every grown-up candidate (*ό ζηλῶν*) had to pass through a noviciate of two stages, which extended over three years, before he could be finally admitted into the order. Upon entering the first stage, which lasted twelve months, the novice (*νεοσύντατος*) had to cast all his possessions into the common treasury. He then received a copy of the regulations of the brotherhood (*διαταν τοῦ τάγματος*), as well as *a spade* (*σκαλίς ἀξινάριον*=**תְּלִי**), to bury the excrement, (comp. Deut. xxiii, 12—14,) *an apron* (*περιζωμα*=**וְרִיז**), used at the lustrations, and *a white robe* (*λευκὴν ἐσθῆτα*=**בְּגָד לְבָן**) to put on at meals, being the symbols of purity. During the whole of this period he was an outsider, and was not admitted to the common meals, yet he had to observe some of the ascetic rules of the Society. If, at the close of this stage, the community found that he had properly acquitted himself during the probationary year, the novice was admitted into the second stage, which lasted two years, and was called *an approacher* (*προσίων ἔγγιον*). During the period which lasted two years he was admitted to a closer fellowship with the brotherhood, and shared in their lustral rites (*καθαρώτερων πρὸς τῶν ὄγνειαν ὑδάτων μεταλαμβάνει*), but was still not admitted to the common meals (*εἰς τὰς συμβιώσεις*), nor to any office. If he passed satisfactorily through the second stage of probation, *the approacher* became *an associate*, or a full member of the society (*ἱμιλητής*,

ὅς εἰς τὸν ὄμιλον ἐγκρίνεται.—**חֶבֶר**), when he was received into the brotherhood and partook of the common meal (*συμβιωτὴς*).

Before, however, he was made *a homiletes*, or finally admitted into close fellowship, he had to bind himself by a most solemn oath (this being the only occasion on which the Essenes used an oath) to observe three things. 1. *Love to God*. 2. *Merciful justice towards all men*; especially to honor nobody as master, to avoid the wicked, to help the righteous, to be faithful to every man, and especially to rulers (*τοῖς κρατοῦσιν*), for without God no one comes to be ruler. And 3. *Purity of character*, which implied humility, love of truth, hatred of falsehood, strict secrecy towards outsiders, so as not to divulge the secret doctrines (*μυστήρια*) to any one, and perfect openness with the members of the order, and, finally, carefully to preserve the books belonging to their sect (*τὰ τῆς αἰρέσεως αὐτῶν βιβλία*), and the names of the angels (*τὰ τῶν ἀγγέλων ὄνόματα*) or the mysteries connected with the *Tetragrammaton* (**שם המפורש**) and the other names of God and the angels, comprised in the theosophy (**מעשה מרכבה**) as well as with the cosmogony (**מעשה בראשית**) which also played so important a part among the Jewish mystics and the Kabalists.

The three sections consisting of candidate (*ὁ ζηλῶν*), approacher (*περοστῶν ἔγγιον*), and associate (*ὁμιλητὴς, ὅς εἰς τὸν ὄμιλον ἐγκρίνεται*), were subdivided into four orders, distinguished from each other by superior holiness. So marked and serious were these distinctions, that if one belonging to a higher degree of purity touched one who belonged to a lower order, *i.e.*, if one of the fourth or highest order came in contact with one of the third or lower order, or if one of the third touched one of the second order, or if one of the second order touched one of the first or lowest order, he immediately became impure, and could only regain his purity by lustrations. From the beginning of the novitiate to the achievement of the

highest spiritual state, there were *eight* different stages which marked the gradual growth in holiness. Thus, after being accepted as a novice and obtaining *the apron* (צְדִיקָה — צְדִיקָה) the symbol of purity, he attained (1) to the state of *outward* or *bodily* purity by baptisms (זְדִיקָה מִבְיאָה לְדִי נְקִיָּה). From this state of bodily purity he progressed (2) to that stage which imposed abstinence from connubial intercourse (נְקִיָּה מִבְיאָה לְדִי פְּרִישׁוֹת), or to that degree of holiness, which enabled him to practise celibacy. Having succeeded in mortifying the flesh in this respect, he advanced (3) to the stage of *inward* or *spiritual* purity (פְּרִישׁוֹת מִבְיאָה לְדִי טָהָרָה). From this stage again he advanced (4) to that which required the banishing of all anger and malice, and the cultivation of a meek and lowly spirit (עֲנוּנוֹת מִבְיאָה). This led him (5) to the culminating point of holiness (לְדִי חֲסִידָה). Upon this summit of holiness he became (6) the temple of the Holy Spirit, and could prophesy (חֲסִידָה מִבְיאָה). Thence again he advanced (7) to that stage in which he was enabled to perform miraculous cures, and raise the dead (רָוחַ קָדֵשׁ לְדִי תָּחָה מִבְיאָה). And finally, he attained (8) to the position of Elias the forerunner of the Messiah (תָּחָה מִבְיאָה לְדִי אֱלֹהִים).

The earnestness and determination of these Essenes to advance to the highest state of holiness were seen in their self-denying and godly life; and it may fairly be questioned whether any religious system has ever produced such a community of saints. Their absolute confidence in God and resignation to the dealings of Providence; their uniformly holy and unselfish life; their unbounded love of virtue, and utter contempt for worldly fame, riches or pleasure; their industry, temperance, modesty and simplicity of life; their contentment of mind and cheerfulness of temper; their love of order, and abhorrence of even the semblance of falsehood; their benevolence and philanthropy; their love for the brethren,

and their following peace with all men ; their hatred of slavery and war ; their tender regard for children, and reverence and anxious care for the aged ; their attendance on the sick, and readiness to relieve the distressed ; their humility and magnanimity ; their firmness of character and power to subdue their passions ; their heroic endurance under the most agonizing sufferings for righteousness' sake ; and their cheerfully looking forward to death, as releasing their immortal souls from the bonds of the body to be for ever in a state of bliss with their Creator—have hardly found a parallel in the history of mankind. No wonder that Jews, of different sects, Greeks and Romans, Christian church historians, and heathen writers have been alike constrained to lavish the most unqualified praise on this holy brotherhood. It seems that the Saviour of the world, who illustrated simplicity and innocence of character by the little child which he took up in his arms, also showed what is required for a holy life in the Sermon on the Mount by a description of the Essenes. So remarkably does this brotherhood exemplify the lessons which Christ propounds in Matth. chap v., &c.

This leads us to consider the question about the origin of this brotherhood, and their relationship to Judaism and Christianity. The assertion of Josephus that they “live the same kind of life which among the Greeks has been ordered by Pythagoras” (vide infra, p. 226, § 4,) has led some writers to believe that Essenism is the offspring of Pythagorism. The most able champion for this view is Zeller, the author of the celebrated *History of Philosophy*. He maintains² “that Essenism, at least as we know it from Philo and Josephus, has, in its essence, originated under Greek and especially under Pythagorean influences,” and tries to support his conclusion by the following summary of the supposed resemblances between Neo-Pythagorism and Essenism. (1) “Both strive to attain to superior holiness by an ascetic life.

² *Geschichte der Philosophie*, vol. iii, part ii, p. 583 ff.

(2) Both repudiate animal sacrifices, the eating of animal food, wine and marriage. (3) Both of them are, however, not quite agreed among themselves about the latter point ; for on both sides there are some who recommend marriage, but restrict connubial intercourse to procreation. (4) Moreover, both demand simplicity of life. (5) Both refrain from warm baths. (6) Both wear white garments, especially at dinner time. (7) Both lay the greatest value upon their purification and eschew everything unclean. (8) Both prohibit oaths, because a pious man does not require them. (9) Both find their social ideal in institutions which it is true were only realized by the Essenes, and in living together with perfect community of goods and unconditional subordination of individuals to their overseers. (10) Both insist on strict secrecy about their schools. (11) Both like symbolic representations of their doctrines. (12) Both support themselves on an allegorical interpretation of ancient traditions, whose authority they recognise. (13) Both worship higher powers in the elements, and pray to the rising sun. (14) Both seek to keep everything unclean from their sight, and for this reason have peculiar prescriptions about the discharge of the duties of nature. (15) Both cultivate the belief in intermediate beings between the supreme Deity and the world. (16) Both devote themselves to magic arts. (17) Both regard above all things the gift of prophesy as the highest fruit of wisdom and piety, and both boast to possess this gift in their most distinguished members. (18) Finally, Both corroborate their peculiar mode of life with a dualistic view of the relation of the spirit and matter, good and evil. (19) Both agree especially in their notions about the origin of the soul, its relationship to the body, and about a future life, only the doctrine of transmigration of souls seems not to have been known among the Essenes.”³

³ The figures before each point of comparison do not exist in the original German ; I have inserted them in the translation in order to facilitate the references to these different points of comparison.

Striking as these resemblances may appear, it will be seen on a closer examination that some of the points which constitute this comparison do not exist in Essenism, that others are either due to the coloring of Josephus or have their origin in Judaism, that the difference between Pythagorism and Essenism are far more numerous and vital than the parallels, and that Zeller's conclusion is therefore not warranted. I shall examine these points *seriatim*.

(1) Asceticism is not foreign to Judaism. We meet with individuals who voluntarily imposed upon themselves ascetic life to be able, as they thought, to give themselves more entirely to the service of God by mortifying the lusts of the flesh, at a very early period of Biblical history; and we need only to refer to the regulations about Nazarites (Numb. vi. 1-21), to the case of Manoah and his wife (Judg. xiii.), to the life of Elijah (1 Kings xviii.-xix.) to the practices of the Rechabites throughout the Scriptures, of persons abstaining from the good things of this world, to see how the Essenes, without (Jer. xxxv. 2, &c.), and to the numerous instances which occur copying the Pythagoreans or any other heathen fraternity, would naturally conclude that asceticism is conducive to a devotional life. (2) As to the repudiation of animal sacrifice, animal food, wine, &c., to which Zeller refers in the second point of comparison, I submit that the Essenes *did not repudiate* animal sacrifices, but that they *could not* offer them on account of the different view which they had about holiness, as Josephus most distinctly declares (*vide infra p. 228*), that neither Philo nor Josephus says a word about their objecting to eat animal flesh or drink wine, and that their celibacy arose from an extension of a law contained in the Pentateuch. Besides, it is not quite so certain that the Pythagoreans did not offer animal sacrifices; Diogenes Laertius and others positively state that Pythagoras himself sacrificed a hecatomb upon his discovering what is called the

Pythagoric theorem, *i.e.* that, in a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the sides.⁴ (4) The fourth comparison about simplicity of life is involved in the first. (5) The statement in the fifth comparison, that the Essenes refrain from warm baths, is purely imaginary ; (6, 7) whilst the white garments and the purifications mentioned in the sixth and seventh parallels are strictly Jewish and Biblical. As symbolic of purity the priests were required to clothe themselves in white linen (Exod. xxviii. 39-42 ; Levit. vi. 10 ; xvi. 4), and the saints in heaven, washed and cleansed from all impurity, are to be clad in white garments (4 Esdras ii. 39-45 ; Enoch lxi. 18 ; Rev. iii. 4 ; vi. 11 ; vii. 9, 14 ; xix. 8) ; soiled garments are regarded as emblematic of impurity (Zech. iii. 3, &c.) Inseparably connected therewith are the frequent purifications or washings enjoined on the priests before entering into the presence of God to perform religious acts (Levit. xvi. 4 ; 2 Chron. xxx. 19), and on the people generally after coming in contact with anything impure (Levit. xi. 25, 40 ; xv. 5-24). The white garments and the frequent purifications of the Essenes, who strove to live after the highest degree of Levitical purity, were therefore in perfect harmony with exaggerated Judaism. (8) As to the assertion in comparison 8 that the Pythagoreans prohibited oaths, it is well known that they did use oaths on important occasions, and that they held it to be most sacred to swear by the number four, which they represented by ten dots in the form of a triangle, so that each side consisted of four dots, as follows :—



⁴ Comp. Diog. Laert. de Vitis Philosophorum, lib. viii. Vit. Pythagor. xii. It is true that Cicero represents Cotta as giving no credit to this story, because, as

The community of goods, the secrecy about their institutions, the symbolic representation of their doctrines, &c., mentioned in comparisons 9, 10, 11, 12, are the natural result of their manner of life. (13) That they worshipped the sun is not borne out by fact, (14) whilst their peculiar manner in performing the functions of nature is in accordance with the injunction of Scripture (Deut. xxiii. 13, 15), which the Essenes, as the spiritual host of the Lord, applied to themselves. (15) As to their very peculiar belief in intermediate beings between the Deity and the world, mentioned in the fifteenth point of comparison, I can only say that Philo and Josephus say nothing about it. (16) Their devotedness to the study of the magic arts was restricted to miraculous cures, and was not peculiar to them; since tradition had made Solomon the author of books on magical cures and exorcisms, and Josephus tells us (*vide infra*, p. 220, note 35) that he had seen other Jews performing these magic cures. (17) Neither is there anything foreign in the opinion, that the power to foretel future events can only be obtained by leading a life of preeminent holiness, for this was the common belief of the Jews, though it is true that the Essenes were the only section of the Jewish community who as a body strove to obtain the gift of prophecy. It, however, must not be forgotten that others too laid claim to this gift. Josephus tells us that when brought as prisoner of war before Vespasian, he addressed the Roman general as follows:—"Thou, Vespasian thinkest that thou hast simply a prisoner of war in me, but I appear before thee as a prophet of important future events. If I had not to deliver to thee a message from God, I would have known what the Jewish law demands, and how a general ought to die. Dost thou want to send me to Nero? For what? Will his successors, who ascend the throne before thee, reign he apprehends, Pythagoras never offered animal sacrifices (*De Natura Deorum*, lib. iii. cap. xxxvi.), but it is also related by Athenaeus (*Deipnosoph.* lib. x.), Plutarch and others.

long on it? No! thou, Vespasian, wilt be emperor and autocrat—thou, and this thy son." (*Jewish War*, iii. 8, § 9). This prophecy of Josephus is also recorded by the celebrated Roman historian Dion Cassius who says: "Josephus, a Jew, was taken prisoner by him (i.e. Vespasian), and put in chains; but he smilingly addressed him: 'Thou puttest me now in chains, but thou wilt loose them again, after twelve months, as emperor,'" (*lib. lxvi. c. 1*); and by Tacitus (*lib. v. c. 13*). What Zeller says in comparisons 18 and 19 about their dualistic view of the relationship of spirit and matter, good and evil, and their notions of the origin of the soul, is entirely owing to Josephus' colouring of the subject, as may be seen from the notes on the extracts from this historian in the second part of this Essay.

Having thus shown that the parallels between Pythagorism and Essenism are more imaginary than real, and that the few things which might be considered as being analogous are unimportant, and are such as will naturally develop themselves among any number of enlightened men who devote themselves almost exclusively to a contemplative religious life, I shall now point out some of the vital differences between the two brotherhoods. 1. The Pythagoreans were essentially polytheists; the Essenes were real monotheistic Jews, worshippers of the Holy One of Israel. 2. The Pythagoreans clustered round Pythagoras as the centre of their spiritual and intellectual life, and estimated the degree of perfection of any of the members by the degree of intimacy which he enjoyed with Pythagoras: the Essenes regarded the inspired Scriptures as their sole source of spiritual life, and called no man master on earth, every one having the same right to teach, and being alike eligible for all the offices in the commonwealth. 3. The Pythagoreans favored matrimony, and we are told that Pythagoras himself had a wife and children; whilst celibacy was the rule of

Essenism, marriage being the exception. 4. The Pythagoreans believed in the doctrine of metempsychosis, which led them to abstain from eating animal flesh, because human souls migrated into animals, and made Pythagoras once intercede in behalf of a dog that was being beaten, because he recognised in its cries the voice of a departed friend: the Essenes believed no such thing. 5. Scientific studies, such as mathematics, astronomy, music, &c., formed an essential part of the Pythagorean system: Essenism strictly forbade these studies as injurious to a devotional life. 6. Pythagorism was occupied with investigating the problems of the origin and constitution of the universe: Essenism regarded such inquiries as impious, and most implicitly looked upon God as the creator of all things. 7. Pythagorism taught that man can control his fortune and overrule his circumstances: Essenism maintained that fate governs all things, and that nothing can befall man contrary to its determination and will. 8. Pythagorism enjoined ointment to be used by its followers: the Essenes regarded it as defilement. 9. The Pythagoreans had a sovereign contempt for all those who did not belong to their ranks: the Essenes were most exemplary in their charity towards all men, and in their unbounded kindness to those who were not of the brotherhood. 10. The Pythagoreans were an aristocratical and exclusive club, and excited the jealousy and hatred not only of the democratical party in Crotona, but also of a considerable number of the opposite faction, so much so that it speedily led to their destruction: the Essenes were meek and lowly in spirit, and were so much beloved by those who belonged to different sects, that Pharisees and Sadducees, Greeks and Romans, Jews and Gentiles, joined in lavishing the highest praise upon them.⁵

⁵ An excellent account of the Pythagorean system is given by Zeller, *Geschichte der Philosophie*. Erster Theil, Tübingen, 1856, pp. 206-365; Grote, *History of Greece*. vol. iv. London, 1857, pp. 527-553; and Mason, in *Smith's Dictionary of Greek and Roman Biography and Mythology*, Article PYTHAGORAS.

As to the relationship which Essenism sustains to Judaism, the very fact that the Essenes, like the other Jews, professed to be guided by the teachings of the Bible, and that a rupture between them and the Jewish community at large is nowhere mentioned, but that on the contrary they are always spoken of in the highest terms of commendation, would of itself be sufficient to prove it. In doctrine, as well as in practice, the Essenes and the Pharisees were nearly alike. Both had four classes of Levitical purity, which were so marked that one who lived according to the higher degree of purity, became impure by touching one who practised a lower degree, and could only regain his purity by lustration. Both subjected every applicant for membership to a noviciate of twelve months. Both gave their novices an apron in the first year of their probation. Both refused to propound the mysteries of the cosmogony and cosmology to any one except to members of the society. Both had stewards in every place where they resided to supply the needy strangers of their order with articles of clothing and food. Both regarded office as coming from God. Both looked upon their meal as a sacrament. Both bathed before sitting down to the meal. Both wore a symbolic garment on the lower part of the body whilst bathing. Amongst both the priest began and concluded the meal with prayer. Both regarded ten persons as constituting a complete number for divine worship, and held the assembly of such a number as sacred. Amongst both of them none would spit to the right hand in the presence of such an assembly. Both washed after performing the functions of nature. Both would not remove a vessel on the Sabbath. And both abstained from using oaths, though it is true that the Essenes alone uniformly observed it as a sacred principle. The differences between the Essenes and the Pharisees are such as would naturally develope themselves in the course of time from the extreme rigour with which the former sought to practise the Levitical laws of

purity. As contact with any one or with anything belonging to any one who did not live according to the same degree of purity, rendered them impure according to the strict application of their laws, the Essenes were in the first place obliged to withdraw from intercourse with their other Jewish brethren, and form themselves into a separate brotherhood. Accordingly the first difference between them and the others was that they formed an isolated order. The second point of difference was on marriage. The Pharisees regarded marriage as a most sacred institution, and laid it down as a rule that every man is to take a wife at the age of eighteen (Comp. *Aboth* v. 21), whilst the Essenes were celibates, which, as we have seen before, also arose from their anxiety to avoid defilement. Hence the declaration in *Aboth d. R. Nathan*—“*there are eight kinds of Pharisees; . . . and those Pharisees who live in celibacy are Essenes*” (c. xxxvii.).⁶ The third difference which existed between them and the Pharisees, and which was also owing to the rigorous application of the Levitical laws of purity, was that they did not frequent the temple and would not offer sacrifices. And fourthly, though they firmly believed in the immortality of the soul, yet, unlike the Pharisees, they did not believe in the resurrection of the body.

The identity of many of the precepts and practices of

6 R. Nathan, the Babylonian as he is called, was Vice-President of the College in Palestine, under the Presidency of Simon III. b. Gamaliel II. A.D. 140. The above-quoted work of which he is the reputed author, as indicated by its title, *אבות רבי נון* i.e. the *Aboth of R. Nathan*, is a compilation of the apothegms and moral sayings of the Jewish fathers (אבות), interspersed with traditional explanations of divers texts of Scripture, consisting of forty-one chapters. Both the historian and moral philosopher will find this work an important contribution to the literary and philosophical history of antiquity. It is printed in the different editions of the Talmud, and has also been published separately with various commentaries, in Venice, 1622 : Amsterdam, 1778, &c., &c.; and a Latin translation of it was published by our learned countryman, Francis Taylor, under the title of *R. Nathanis Tractatus de Patribus, latine cum Notis. London, 1654, 4to.* Comp. Zunz, *Die gottesdienstlichen Vorträge der Juden. Berlin, 1832, p.p. 108, 109;* Fürst, *Kultur-und Literaturgeschichte der Juden in Asien. Leipzig, 1849, p. 16 ff;* by the same author, *Bibliotheca Judaica, volume iii. Leipzig, 1863, p. 19 ff;* Steinschneider, *Catalogus Libr. Hebr. in Bibliotheca Bodleiana col. 2,032 ff.*

Essenism and Christianity is unquestionable. Essenism urged on its disciples to seek first the kingdom of God and his righteousness: so Christ (Matt. vi. 33; Luke xii. 31). The Essenes forbade the laying up of treasures upon earth: so Christ (Matt. vi. 19-21). The Essenes demanded of those who wished to join them to sell all their possessions, and to divide it among the poor brethren: so Christ (Matt. xix. 21; Luke xii. 33). The Essenes had all things in common, and appointed one of the brethren as steward to manage the common bag; so the primitive Christians (Acts ii. 44, 45; iv. 32-34; John xii. 6; xiii. 29). Essenism put all its members on the same level, forbidding the exercise of authority of one over the other, and enjoining mutual service; so Christ (Matt. xx. 25-28; Mark ix. 35-37; x. 42-45). Essenism commanded its disciples to call no man master upon the earth; so Christ (Matt. xxiii. 8-10). Essenism laid the greatest stress on being meek and lowly in spirit; so Christ (Matt. v. 5; xi. 29). Christ commended the poor in spirit, those who hunger and thirst after righteousness, the merciful, the pure in heart, and the peacemakers; so the Essenes. Christ combined the healing of the body with that of the soul; so the Essenes. Like the Essenes, Christ declared that the power to cast out evil spirits, to perform miraculous cures, &c., should be possessed by his disciples as signs of their belief (Mark xvi. 17; comp. also Matt. x. 8; Luke ix. 1, 2; x. 9). Like the Essenes, Christ commanded his disciples not to swear at all, but to say yea, yea, and nay, nay. The manner in which Christ directed his disciples to go on their journey (Matt. x. 9, 10) is the same which the Essenes adopted when they started on a mission of mercy. The Essenes, though repudiating offensive war, yet took weapons with them when they went on a perilous journey; Christ enjoined his disciples to do the same thing (Luke xxii. 36). Christ commended that elevated spiritual life, which enables

a man to abstain from marriage for the kingdom of heaven's sake, and which cannot be attained by all men save those to whom it is given (Matt. xix. 10-12 ; comp. also 1 Cor. viii.) ; so the Essenes who, as a body, in waiting for the kingdom of heaven (**מלכות השמים**) abstained from connubial intercourse. The Essenes did not offer animal sacrifices, but strove to present their bodies a living sacrifice, holy and acceptable unto God, which they regarded as a reasonable service ; the Apostle Paul exhorts the Romans to do the same. (Rom. xii. 1). It was the great aim of the Essenes to live such a life of purity and holiness as to be the temples of the Holy Spirit, and to be able to prophesy : the apostle Paul urges the Corinthians to covet to prophesy (1 Cor. xiv. 1, 39). When Christ pronounced John *to be Elias* (Matt. xi. 14), he declared that the Baptist had already attained to that spirit and power which the Essenes strove to obtain in their highest stage of purity.⁷ It will therefore hardly be doubted that our Saviour himself belonged to this holy brotherhood. This will especially be apparent when we remember that the whole Jewish community, at the advent of Christ, was divided into three parties, the Pharisees, the Sadducees and the Essenes, and that every Jew had to belong to one of these sects. Jesus who, in all things, conformed to the Jewish law, and who was holy, harmless, undefiled, and separate from sinners, would therefore naturally associate himself with that order of Judaism which was most congenial to his holy nature. Moreover, the fact that Christ, with the exception of once, was not heard of in society till his thirtieth year, implying that he lived in seclusion with this fraternity, and that though he frequently rebuked the Scribes, Pharisees and Sadducees, he never denounced the Essenes, strongly confirms this conclusion. There can be no difficulty in admitting that the

7 For the passages embodying the sentiments of the Essenes, which constitute the above comparisons, we must refer to the second part of this Essay and the notes.

Saviour of the world, who taught us lessons from the sparrows in the air, and the lilies in the field, and who made the whole realm of nature tributary to his teachings, would commend divine truth wherever it existed. But whilst Christ propounded some of the everlasting truths which were to be found less adulterated and practised more conscientiously among the Essenes than among the rest of the people, he repudiated their extremes. They were ascetics ; he ate and drank the good things of God (Matt, xi. 19). They considered themselves defiled by contact with any one who practised a lower degree of holiness than their own ; Christ associated with publicans and sinners, to teach them the way to heaven. They sacrificed the lusts of their flesh to gain spiritual happiness for themselves ; Christ sacrificed himself for the salvation of others.

It is now impossible to ascertain the precise date when this order of Judaism first developed itself. According to Philo, Moses himself instituted this order ; Josephus contents himself with saying that they existed “ ever since the ancient time of the fathers ; ” whilst Pliny assures us that, without any one being born among them, the Essenes, incredible to relate, have prolonged their existence for *thousands of ages.*⁸ Bating, however, these assertions, which are quite in harmony with the well known ancient custom of ascribing some pre-Adamite period to every religious or philosophical system, it must already have become apparent, from the description of it, that the very nature of the Essenes precludes the possibility of tracing its date. The fact that the Essenes developed themselves gradually, and at first imperceptibly, through intensifying the prevalent religious notions, renders it impossible to say with exactness at what degree of intensity they are to be considered as detached from the general body.

⁸ Compare the account of Philo, p. 212 ; Pliny, p. 216 ; Josephus, p. 228 ; in the second part of this Essay.

The first mention we have of their existence is in the days of Jonathan the Maccabæan, B.C. 166. (*Joseph. Antiq.* xiii. 5, 8). We then hear of them again in the reign of Aristobulus I., B.C. 106, in connection with a prophecy about the death of Antigonus, uttered by Judas an Essene, of which Josephus gives the following account. "Judas, an Essene, whose predictions had up to this time never deceived, caused great astonishment on this occasion. When he saw at that time Antigonus pass through the temple, he called out to his disciples, of whom he had no small number—'Oh ! it would be better for me to die now, since truth died before me, and one of my prophecies has proved false. Antigonus, who ought to have died this day, is alive ; Strato's Tower, which is six hundred furlongs distance from here, is fixed for his murder, and it is already the fourth hour of the day [ten o'clock] ; time condemns the prophecy as a falsehood.' Having uttered these words, the aged man sunk into a long, dejected, and sorrowing silence. Soon after, the report came that Antigonus was murdered in the subterranean passage which, like Cesarea on the sea side, was also called Strato's Tower. It was this circumstance that misled the prophet." (*Jewish War*, i. 3, § 5 ; *Antiq.* xiii. 11, § 2). The third mention of their existence we find in the well known prophecy of the Essene Manahem, uttered to Herod when a boy.⁹ Now these accounts most unquestionably show that the Essenes existed at least two centuries before the Christian era, and that they at first lived amongst the Jewish community at large. Their residence at Jerusalem is also evident from the fact that there was a gate named after them (*Ἐσσηνῶν πύλη Joseph. Jewish War*, v. 4, § 2). When they ultimately withdrew themselves from the rest of the Jewish nation, the majority of them settled on the north-west shore of the Dead Sea, sufficiently distant to escape its noxious exhalations, and the rest lived in scattered com-

⁹ This prophecy is given in full in the second part of this Essay, p. 226.

munities throughout Palestine and Syria. Both Philo and Josephus estimated them to be above four thousand in number. This must have been exclusive of women and children. We hear very little of them after this period (i.e. 40 A.D.) ; and there can hardly be any doubt that, owing to the great similarity which existed between their precepts and practices and those of the primitive Christians, the Essenes as a body must have embraced Christianity.

10 Zeitschrift für die religiösen Interessen des Judenthums. Berlin, 1856, p. 449.

11 Geschichte des Judenthums und seiner Secten, vol. 1. Leipzig, 1857, p. 207.

because יְשָׁנָן *the high priest's breast-plate*, for which the Septuagint has λογεῖον or λόγιον is translated by him ἱστημι, or that he might have deduced this idea from יְשָׁנָן itself, and traced it to λογεῖον or λόγιον as *endowed with the gist of prophecy*.¹² In Aboth of R. Nathan¹³ it is written יְשָׁנָן עֲשָׂאֵנָן from עֲשָׂאֵנָן *to do, to perform*, and accordingly denotes *the performers of the law*.

4. Epiphanius again calls them Ὀσσαῖοι and Ὀσσηνοι and tells us that it etymologically signifies στιβαρὸν γένος *the stout or strong race*, evidently taking it for יְשָׁנָן or עֲשָׂאֵנָן. 5. In another place Epiphanius affirms that the Essenes borrowed their name from Jesse the father of David, or from Jesus, whose doctrines he ascribes to them; explaining the name Jesus to signify in Hebrew *a physician*; and calls them Jesseans.¹⁴ In this he is followed by Petitus who makes them so related to David that they were obliged to take the name of his father Jesus or Jesse;¹⁵ although Jesus does not signify physician but *God-help*. 6. Suidas (*Lex s. v.*) and Hilgenfeld (*Die jüdische Apokal. p. 278*), make it out to be the form יְשָׁנָן = θεωρητικοί *seers*, and the latter maintains that this name was given to them because they pretended to see visions and to prophesy. 7. Josippon b. Gorion¹⁶ (*lib. iv. sects. 6, 7, p.p. 274 and 278, ed. Breithaupt*), and

12 As Mr. Westcott, the writer of the article *ESSENES* in *Smith's Dictionary of the Bible*, has misunderstood this passage and wrongly represented Jost himself as deriving this name from יְשָׁנָן *the silent, the mysterious*, we give Jost's own words:—"Uns will scheinen, dass Josephus den Namen allerdings von יְשָׁנָן schweigen, geheimnissvoll sein, ableitet; dahin führt seine Uebertragung des Wortes יְשָׁנָן in die griechischen Buchstaben ἱστημι Ed. Hav. Ant. 1, 147, welches Wort die LXX λογεῖον übersetzen. Da das Wort יְשָׁנָן seinen Zeitgenossen sehr geläufig war, so konnte er annehmen, dass man sich unter dem Namen der Sekte einen angemessenen Begriff dachte und er keiner Erläuterung bedürfe. Ja, es wäre möglich, dass er den Begriff aus יְשָׁנָן selbst ableitet, und auf λογεῖον oder λόγιον, als mit Weissagung begabte, zurückführte. Vergleiche Gfrörer, Philo 1, 196."

13 Aboth di. R. Nathan, cap. xxxvi.

14 Comp. Epiphan. Haeres. xix. lib. i. tom. ii. sect. 4, p. 120, ed. Petav.

15 Comp. Petite Variae Lectiones, c. xxviii. p. 2600.

16 Josippon b. Gorion also called Gorionides, lived in Italy about the middle of the tenth century. He is the compiler of the celebrated Hebrew Chronicle called Josippon, or the Hebrew Josephus. His real character and the value of his Chronicle are discussed under the article JOSSIPPON in *Dr. Alexander's edition of Kitto's Cyclopædia of Biblical Literature*.

Gale (*Court of the Gentiles, part ii.*, p. 147), take it for the Hebrew חֲמִידִים the pious, the puritans. 8. De Rossi¹⁷ (*Meor Enaim*, 32 a), Gfrörer (Philo, ii. p. 341), Herzfeld (*Geschichte d. V. Israel* ii. p. 397), and others, insist that it is the Aramaic אַסִּיא = ἀραπευτής physician, and that this name was given to them because of the spiritual or physical cures they performed. Indeed, De Rossi and Herzfeld will have it that the sect *Baithusians* mentioned in the Talmud is nothing but a contraction of בֵּית אַסִּיא the school or sect of physicians, just as בֵּית הִילֵּל stands for the school of Hillel. 9. Salmasius affirms that the Essenes derived their name from the town called *Essa*, situated beyond the Jordan, which is mentioned by Josephus (*Antiq.* xiii. 15, § 2), or from the place *Vadi Ossis*.¹⁸ 10. Rappaport (*Erech Milln*, p. 41), says that it is the Greek ἵσος an associate, a fellow of the fraternity. 11. Frankel (*Zeitschrift*, 1846, p. 449, &c.), and others think that it is the Hebrew expression צְנוּעִים the retired. 12. Ewald (*Geschichte d. Volkes Israel*, iv. p. 420), is sure that it is the Rabbinic צָן servant (of God), and that the name was given to them because it was their only desire to be ἀραπευταὶ θεοῦ. 13. Graetz (*Geschichte der Juden* iii. p. 468, second ed.) will have it that it is from the Aramaic סַחְא to bathe, with Aleph prostheticum, and that it is the shorter form for אַסְחָאִי צְפְרָא אַסְמָעֵרְבָּאַפְּתִּיסְתָּא hemerobaptists; the Greek form Ἐσσαῖος, Ἐσσαῖοι being nothing but ASSAÏ or ESSAÏ with פ elided. 14. Dr. Löw (*Ben Chananja* vol. i. p. 352) never doubts but that they were called *Essenes* after their founder, whose name he tells us was יְשָׁעִי, the disciple of Rabbi Joshua ben Perachja. 15. Dr. Adler (*Volkslehrer*, vi. p. 50), again submits that it is from the

17 De Rossi, also called *Asarja min Ha-Adomim*, was born at Mantua in 1513, and died 1577. For an account of this eminent Jewish scholar, who may be regarded as the father of Biblical criticism at the time of the Reformation, see *Dr. Alexander's edition of Kitto's Cyclopædia of Biblical Literature*, Article Rossi.

18 Salmas. Plinian. exercitat. in Solinum cap. xxxv. p. 432, edit. Ultraject.

Hebrew אָסֵר to bind together, to associate, and that they were called אָסְרִים because they united together to keep the law. 16. Dr. Cohen suggests the Chaldee root עַשׂ to be *strong*, and that they were called עַשְׂנִי because of their strength of mind to endure sufferings and to subdue their passions. (*Comp. Frankel's Monatschrift* viii. p. 272). 17. Oppenheim thinks that it may be the form עֹשֵׂין and stand for עֹשֵׂין טהָרָת הַקָּדֵשׁ or עֹשֵׂין טהָרָת הַמִּתְאָת observers of the laws of purity and holiness. (*Ibid.*). 18. Jellinek (*Ben Chananja* iv. 374), again derives it from the Hebrew חַצֵּן *sinus*, περιζωμα, alluding to the *apron* which the Essenes wore; whilst, 19, Others again derived it from חָסִיא *pious*. The two last-mentioned explanations seem to have much to recommend them, they are natural and expressive of the characteristics of the brotherhood. I, however, incline to prefer the last, because it plainly connects the Essenes with an ancient Jewish brotherhood called *Chassidim* the *pious*, who preceded the Essenes, and from whom the latter took their rise. Those who wish to trace this connection, will find an article on the *Chassidim* in Dr. Alexander's edition of KITTO'S CYCLOPÆDIA OF BIBLICAL LITERATURE.

II.

I shall now give in chronological order the description of the Essenes found in the writings of Philo, Pliny, Josephus, Solinus, Porphyry, Eusebius and Epiphanius, and subjoin such notes as will explain the difficulties, and show the historical value of the respective documents.

As Philo is the oldest in point of time, we will begin with him. The exact date of the birth of this celebrated Jewish-Alexandrian philosopher is not known. It is, however, generally agreed that he was born in Alexandria between the years 20 and 1 B.C., and died about 60 A.D. Having resided all his lifetime in Alexandria, his information about the Essenes, who lived in Palestine, was derived from hearsay. This will account for some of the inaccuracies in his description of this remarkable brotherhood. He has given us two accounts of them, one in his treatise, entitled *Every Virtuous Man is Free*, and the other in his treatise, called *Apology for the Jews*. The latter is no longer extant, but Eusebius has preserved the fragments which speak of the Essenes in his work, entitled *Præparatio Evangelica* viii. 11. The description of the so-called contemplative Essenes, or Therapeutæ, which is generally appealed to as illustrating the doctrines and practices of the brotherhood in question, has nothing whatever to do with the real Palestinian Essenes; and it is almost certain that it is one of the many apocryphal productions fathered upon Philo, as may be seen from Graetz's elaborate and masterly analysis of it.¹ Philo's first account is contained in his treatise entitled *Every Virtuous Man is Free*, and is as follows:²

¹ Comp. Graetz, *Geschichte der Juden*. Dritter Band, Zweite Auflage, Leipzig. 1863, p. 464, &c.; Frankel, *Programm des jüdisch-theol. Seminars von 1854*.

² Comp. Philonis Opera, ed. Mangey. London, 1742, vol. ii. pp. 457-46.

“ Palestine, and Syria too, which are inhabited by no slight portion of the numerous population of the Jews, are not barren of virtue. There are some among them called Essenes (Ἐσσαῖοι),—in number more than four thousand,—from, as I think, an incorrect derivation from the Greek homonym *hosiotēs*, holiness (*παράνυμοι ὁσιότητος*), because they are above all others worshippers of God (*Θεοπενταὶ Θεοῦ*). They do not sacrifice any animals, but rather endeavour to make their own minds fit for holy offering (*ἱεροπρεπεῖς διανοίας*).³ They, in the first place, live in villages, avoiding cities on account of the habitual wickedness of the citizens, being sensible that as disease is contracted from breathing an impure atmosphere, so an incurable impression is made on the soul in such evil company.⁴ Some of them cultivate the earth, others are engaged in those diverse arts which promote peace, thus

³ Josephus, who also mentions this fact, distinctly says that their not offering sacrifices in the temple is owing to the different degree of holiness which they practised. (*Vide infra* p. 228.) From the repeated declarations in the Bible, that a life of uniform obedience and faithful service is far more acceptable to God than the cattle of a thousand hills (1 Sam. xv. 22; Ps. xl. 7; 1. 7-14; li. 17; Prov. xxxi. 3; Isa. i. 11, 17; lv. 3; Jer. vii. 21-23; Hos. vi. 6; xiv. 3; Micah, vi. 6-8), the Essenes could easily be reconciled to their abstaining from offering animal sacrifices, and would be led to attach infinitely greater importance to the presenting of their bodies a living sacrifice, holy and acceptable to God. (Comp. also Rom. xii. 1). This circumstance led Pettinus to the conclusion that Herod, who was friendly to the Essenes in consequence of the favorable prophecy about him uttered by the Essene Menahem (*vide infra* p. 226), employed them to translate the Prophets and the Psalms into Greek, and that they availed themselves of the opportunity to introduce their tenets and rites into this version, now called the Septuagint. Thus, for instance, when David said “Sacrifice and burnt offering thou didst not desire, mine ears hast thou opened” (Ps. xl. 6), the Essenes rendered it “Sacrifice and burnt offering thou dost not desire, but a body hast thou prepared me,” interpolating three of their tenets. 1. They made the Prophet speak absolutely, as if God had entirely rejected sacrifices because they would offer him none. 2. By dropping the words, “mine ears hast thou opened,” they showed their disapprobation of slavery. (Comp. Exod. xxi). And 3, by substituting “a body hast thou prepared me,” they understood the college of devout Essenes, who met together as a body, and whom God appointed instead of sacrifice. Comp. Basnage, *History of the Jews*, English translation. London, 1708, p. 128.

⁴ This is not the only reason why the Essenes withdrew from cities. Their observance of the Levitical laws of purity which rendered them impure when they came in contact with those who did not live according to the same rules, was the principal cause of their living separately. (*Vide supra* p. 163, note 1.) Philo, however, states the first reason because the Greeks, for whom he wrote, understood it better than the second, which is so peculiarly Jewish in its character.

benefiting themselves and their neighbours. They do not lay up treasures of gold or silver,⁵ nor do they acquire large portions of land out of a desire for revenues, but provide themselves only with the absolute necessities of life. Although they are almost the only persons of all mankind who are without wealth and possessions—and this by their own choice rather than want of success—yet they regard themselves as the richest, because they hold that the supply of our wants, and contentment of mind, are riches, as in truth they are.⁶

“No maker of arrows, darts, spears, swords, helmets, breast-plates, or shields—no manufacturer of arms or engines of war, nor any man whatever who makes things belonging to war, or even such things as might lead to wickedness in times of peace, is to be found among them.⁷ Traffic, innkeeping, or navigation, they never so much as dream of, because they repudiate every inducement to covetousness. There is not a single slave to be found among them, for all are free, and mutually serve each other. They condemn owners of slaves, not only as unjust, inasmuch as they corrupt the principle of equality, but also as impious, because they destroy the law of nature, which like a mother brought forth and nourished all alike, and made them all legitimate brethren, not only in word but in deed ; but this relationship, treacherous covetousness, rendered over-bearing by success, has destroyed by engendering enmity instead of cordiality, and hatred instead of love.

“They leave the logical part of philosophy, as in no respect necessary for the acquisition of virtue, to the word catchers ; and the natural part, as being too difficult for human nature, to the astrological babblers, excepting that part of it which treats upon the existence of God and the origin of the

⁵ The same thing Christ urged on his disciples. Comp. Matth. vi. 19-21.

⁶ This simple desire for the supply of our daily bread, and the contentment of mind here spoken of, are also commended by our Saviour. (Matth. vi. 11, 25-34.)

⁷ Believing that all they that take the sword shall perish with the sword. Comp. Matth. xxvi. 52.

universe;⁸ but the ethical part they thoroughly work out themselves, using as their guides the laws which their fathers inherited, and which it would have been impossible for the human mind to devise without divine inspiration. Herein they instruct themselves at all times, but more especially on the seventh day. For the seventh day is held holy, on which they abstain from all other work, and go to the sacred places called synagogues, sit according to order, the younger below the elder, and listen with becoming attention. Then one takes the Bible and reads it, and another of those who have most experience comes forward and expounds it, passing over that which is not generally known, for they philosophise on most things in symbols according to the ancient zeal.

“They are instructed in piety, holiness, righteousness, economy, politics, in knowledge of what is truly good, bad and indifferent, to choose things that are necessary, and to avoid the contrary. They use therein a threefold rule and definition, viz. : love of God, love of virtue, and love of mankind.⁹ Of their love to God, they give innumerable demonstrations—*e.g.* their constant and unalterable holiness (*άγνεια*) throughout the whole of their life ; their avoidance of oaths¹⁰ and falsehoods, and their firm belief that God is the source of all good, but of nothing evil. Of their love of virtue they give proofs in their contempt for money, fame, and pleasures,

8 The Apostle Paul, too, admonished the Colossians to “beware lest any man spoil you through philosophy.” (Col. ii. 8.)

9 Thus also Christ, when he was asked which was the greatest commandment in the law, declared, love to God and love to our neighbour, and that on these two hang all the law and the prophets. (Comp. Matth. xxii. 36-40.)

10 Although the taking of oaths was discountenanced by the Jews generally (Comp. *Eccl.* xxiii. 11, &c. ; and especially *Philo De decem oraculis* § 17, Opp. Tom. ii. p. 194, &c., ed. Maugey) ; and the Pharisees took great care to abstain as much as possible from using them (Comp. *Shevuoth* 39, b ; *Gittin* 35, a ; *Bemidbar Rabba* c. xxii) ; yet the Essenes were the only order who laid it down as a principle not to swear at all, but to say yea, yea, and nay, nay. So firmly and conscientiously did they adhere to it that Herod, who on ascending the throne had exacted an oath of allegiance from all the rest of the Jews, was obliged to absolve the Essenes from it. (Comp. *Joseph. Antiq.* book xv. chap. x. § 4). Christ too, laid it down as a principle for his disciples not to swear at all, but to say yea, yea, and nay, nay. (Comp. Matth. v. 33-37.)

their continence, endurance, in their satisfying their wants easily, simplicity, cheerfulness of temper, modesty, order, firmness, and every thing of the kind. As instances of their love to man, are to be mentioned their benevolence, equality, and their having all things in common, which is beyond all description, and about which it will not be out of place to speak here a little.

“First, then, no one has his own house, so that it also belongs to all. For, besides that, they all live together in sodalities ; it is also open to those of the brotherhood who come from other places. Moreover, they have all one common treasury and store of provisions, common garments, and common food for all who eat together. Such a mode of sleeping together, living together, and eating together, could not be so easily established in fact among any other people ; and indeed it would be impossible. For whatever they receive daily, if they work for wages, they do not retain it as their own, but give it to the common stock, and let every one that likes make common use of it.¹¹ Those that are sick are not neglected because they can earn nothing, but have what is necessary for their aid from the common stock, so that they ever fare richly without wanting anything. They manifest respect, reverence and care for the aged, just as children do for their parents, administering to them a thousand times with all plentifullness both with their hands and their counsels in their old age.

“Such champions of virtue does a philosophy produce which is free from the subtlety of Greek word-splitting, and which deals with subjects tending to the exercise of praiseworthy actions, and giving rise to invincible freedom. This was seen in the fact that many tyrants have arisen from time to time in that country, differing in character and conduct.

¹¹ This community of goods was also adopted by the early Christians, who, as we are told, “sold their possessions and goods, and parted them to all as every man needed.”—(Comp. Acts, ii. 45, iv. 34, 35.)

Some of them endeavoured to surpass in ferocity wild beasts ; they omitted no manner of barbarity, they sacrificed the vanquished in whole troops, or, like butchers, cut off pieces and limbs of those that were still living, and did not leave off till retributive justice, which governs the affairs of man, plunged them into similar miseries. Others, again, converted their frenzy and madness into a different kind of wickedness. They adopted an inexpressible bitterness, spake gently, and betrayed a ferocious temper under the mask of gentle language ;¹² they fawned like poisonous dogs, and brought about irremediable miseries, leaving behind them in the cities, as monuments of their impiety and hatred of mankind, the never to be forgotten miseries. But neither the cruel tyrant nor the wily hypocrite could get any advantage over the said brotherhood of Essenes or *holy ones* (*Ἐσσαίων ἡ ὁσίων*), but disarmed by the virtues of these men, all recognised them as independent and free by nature, praised their common meals and their community of goods, which surpasses all description, and is an evident proof of a perfect and very happy life."

Philo's second account, which has been preserved by Eusebius in his *Praep. Evang.*, viii, 11, from the lost treatise entitled *Apology for the Jews*, is as follows :—¹³

"Our lawgiver, Moses, formed innumerable (*μυρίους*) disciples into a fellowship called Essenes,¹⁴ who, as it appears, obtained this appellation by virtue of their holiness (*παρὰ τὴν ὁσιότητα*). They dwell in many cities of Judea, and in villages, and

12 The account here given of the sufferings of the Essenes bears a very striking resemblance to the description in the *Epistle to the Hebrews* xi. 36-38 ; and it may be that the Apostle refers to this extraordinary brotherhood.

13 This fragment which Eusebius has preserved is given in Philo's Works, ed. Mangey, vol. ii., p. 622, *seq.*

14 The tracing of this brotherhood to Moses is in accordance with the practice which generally prevailed among the Jews of ascribing the origin of every law, mystical doctrine or system, which came into vogue in the course of time, either to Ezra, Moses, Noah or Adam. Thus we are told in the Jerusalem Talmud (*Pea*, ii. 6), and the Midrash (*Cohelleth*, 96 d.), that all the Scriptural learning which developed itself in course of time, and everything which a *Talmid Vatic* might bring to light, were revealed to Moses beforehand on Mount Sinai.

in large and populous communities. Their order is not founded upon natural descent, but upon admiration for virtue and sincere love for man. Hence there are properly speaking no newly born ones among the Essenes, no children, no youths, as the dispositions of these are unstable and liable to change from the imperfections incident to their age;¹⁵ but they are all full grown men who are already approaching old age; and are no longer carried away by the impetuosity of their bodily passions, but possess the genuine and the only true and real liberty. A proof of their freedom is to be found in their life. None of them strives to acquire any private property, house, slave, farm, flocks, herds, or anything which might be regarded as a source of riches, but they all give everything to the common stock from which the common wants of all are alike supplied.

“They all dwell together in the same place, form themselves into companies, societies, combinations and unions,¹⁶ and work together all their life for the common good of the brotherhood. The different members of the order are engaged in different employment; they work cheerfully and industriously, and never try to leave their employment on account of cold, heat, or any change of weather. They go to their daily work before the sun rises, and do not leave off till some time after it has set, when they return home rejoicing no less than those who have been exercising themselves in gymnastic contests.¹⁷ They believe that their employment is a sort of gymnastic exercise of more benefit to life, greater pleasure both to soul and body, and of a more enduring advantage than any mere athletic labours, because they can cheerfully continue in their

15 This refers to juvenile *members of the fraternity*, as the Essenes did adopt children, and trained them up to the practices of the order. *Vide infra* p. 217.

16 The four companies here mentioned most probably refer to the four different classes into which the Essenes were divided, described more minutely by Josephus. *Vide infra*, p. 223, note 45.

17 So also the Apostle Paul recommends us not to be slothful in business, but fervent in spirit, serving the Lord.—(Rom. xii. 11.)

work as a recreation even when youth and bodily strength are gone. Those who are acquainted with the cultivation of the land are engaged in agriculture ; others, again, who understand the management of animals, attend to the flocks ; some are skilful in the management of bees ; and others again, are artizans and manufacturers, thus guarding against the want of anything. They do not omit anything which is requisite to supply the absolute necessities of life.

“ The appointed steward and general manager receives the wages which the different people get for their respective employments, and forthwith buys plenty of food and other necessaries of life. They eat at the same table, and have every day the same food, being lovers of frugality and moderation, and averse to luxury and extravagance as a disease of both mind and body. Not only is their table in common, but their dress too is in common. They have a store of rough cloaks in the winter, and in the summer cheap garments without sleeves, to which every one can go and freely take whichever kind he wants, for whatever belongs to one belongs to all, and whatever belongs to all belongs to each individual.

“ If one of them is sick, he is cured from the common resources, and is attended to by the general care and anxiety of the whole body. The old men, even if they happen to be childless,¹⁸ end their lives in a most happy, prosperous and tenderly cared for old age, as if they were not only the fathers of many children, but were even also particularly happy in an affectionate offspring. They are looked upon by such a number of people as worthy of so much honour and provident regard, that they think themselves bound to care for them even more from inclination than from any tie of natural affection.

“ Perceiving, with more than ordinary acuteness and accuracy, what is alone, or at least above all other things, calculated

18 That is if he belongs to the class of Essenes who practised celibacy ; for there were those among them who had wives and families. *Vide infra* p. 225.

to dissolve such connections, they repudiate marriage ; and at the same time practice continence in an eminent degree. For no one of the Essenes marries a wife, because woman is a selfish and excessively jealous creature, and has great power to destroy the morals of man, and to mislead with continual tricks ; for she is always devising flattering speeches and other kinds of hypocrisy as on a stage ; bewitching the eyes and the ears ; and when they are subjugated like things stultified, she proceeds to undermine the ruling intellect.¹⁹

“ But when she has children, the woman becomes full of pride and arrogance, audaciously speaks out that which she previously merely indicated in treacherous disguise, and without any shame compels one to do whatever is hostile to the brotherhood ; for he who is chained by the charms of a woman or cares for children by necessity of nature, is no longer the same person to others, but is entirely changed, having unawares become a slave instead of a free man.

19 The Mosaic law regards conjugal intercourse as polluting, and enjoins bathing after it (Levit. xv. 18.) Hence, when the children of Israel had to sanctify themselves in the highest degree, so as to be fit to receive the law from Mount Sinai, they were commanded not to approach their wives (Exod. xix. 15). Hence, also, those who had the charge of the shew-bread polluted the sacred loaves by going to their wives (1 Sam. xxi. 4). And hence the remark of the Apostle Paul, that in order to give themselves to fasting and prayer, man and wife may keep aloof from each other by mutual consent (1 Cor. vii. 5). The same laws obtained among all nations of antiquity. Thus, among the Egyptians, Babylonians, Arabians, Greeks and Romans, both man and wife had to bathe after connubial intercourse (*Herod.* i. 198). No one was allowed to go after it to the temple without bathing (*Herod.* ii. 64; *Suet. Aug.* xciv. 5; *Pers.* ii. 50, &c.); and the priests had to abstain from approaching their wives when they were ministering in holy things (*Porphyrius, de Abstinentia*, lib. ii. 50; iv. 7; *Plutarch. Sympos.* iii. 6; *Tibul.* lib. ii. Eleg. 1, 11, &c.; *Ovid. Metam.* x. 434, &c.) Now, as the Essenes strove to be in a perpetual state of sanctification, regarded their refectory as a sanctuary and their meals as sacraments, and most anxiously avoided contact with every thing that defiled, they had of necessity to extend these Mosaic laws, which enjoin abstinence from connubial intercourse as a means of sanctification, and which regard those who indulged in it as defiled, to the whole course of their life ; and they had therefore to be celibates. This extension of the Mosaic law was moreover deemed desirable in consequence of the general conviction which the Jews entertained, in common with other nations, that no woman remains faithful to her husband, and that they all defile the bed of marriage. Philo, in the passage before us, and Josephus, as we shall see afterwards (*vide infra p. 217 § 2*), only give the latter reason, to suit their Greek readers who could both understand it better and sympathise with it more than with the former.

“ Such is the enviable system of life of the Essenes, so that not only private individuals but even mighty kings have admired them, venerated their brotherhood, and rendered their dignity and nobleness still higher by the praise and honours which they lavished upon them.”

Next, in point of time, is Caius Plinius Secundus, called Major, or the elder, the celebrated author of the *Historia Naturalis*, who was born in A.D. 23, and died A.D. 79. Pliny’s notice of the Essenes, which is to be found in his Natural History, book v., chap. xvii., is as follows :

“ Towards the west [of the sea] and sufficiently distant from it, so as to escape its noxious exhalations (*ab occidente litora Esseni fugiunt, usque qua nocent*), are the Essenes. They are a hermitical society, marvellous beyond all others throughout the whole earth. They live without any women, without gratifying sensual desires, without money, and in the company of palm trees. Their ranks are daily made up by multitudes of new comers who resort to them ; and who being weary of life, and driven by the surges of ill-fortune, adopt their manner of life. Thus it is that, through thousands of ages (*per saeculorum millia*),²⁰ incredible to relate, this people prolongs its existence without any one being born among them : so fruitful to them are the weary lives of others.”

Next in point of time is Josephus, or Joseph ben Matthias, better known by the name Flavius Josephus, who was born in Jerusalem about 37, A.D. The description which this learned Jewish warrior and historian gives us of the Essenes, although somewhat marred by being made to harmonise with the systems of Greek philosophy, is very important, inasmuch as Josephus was not only a Palestinian Jew, but at one period of his life had actually joined the brotherhood. He tells us in his autobiography, that when sixteen years old he determined to

20 This is simply a repetition of what the Essenes themselves said about their origin, in accordance with a common practice among the Jews.—*Vide supra p. 212, note 14.*

examine for himself the respective merits of the three predominant sects, viz., of the Pharisees, Sadducees and Essenes, with the view of making a selection from among them. His accounts of the Essenes are dispersed through his works. The following is the first description contained in his *Jewish War*, book ii, chap. viii, sec. 2—13.

“ § 2. There are three sects of philosophers among the Jews. The followers of the first are called Pharisees, of the second Sadducees, and of the third, who really seem to practise holiness, Essenes.²¹ Jews by birth, they love each other more than the others.²² They reject pleasure as an evil, and regard continence and not yielding to passions as virtues. They despise marriage, and adopt the children of others while still tender and susceptible of instruction,²³ and regard them as their own relations, and train them in their practices. They do not, however, repudiate marriage, and its consequent succession of the race in themselves ; but they are afraid of the lasciviousness of women, and are persuaded that none of them preserve their fidelity to one man.²⁴

“ § 3. They despise riches, have all things in common in a very admirable manner, and there is not one to be found among them who is richer than another ; for it is a law that those who enter the sect must give up their possessions to the

21 This representation of the three Jewish sects as different philosophical schools, and the supposed resemblance of the Essenes to the Pythagoreans, which he mentions afterwards, (*vide infra Antiq.* xv. 10; § 4, p. 226) and which have misled modern writers, are nothing but a desire on the part of Josephus to make the divers teachings of his co-religionists correspond to the different systems of Greek philosophy. It is this anxiety to shew the Gentiles, for whom he wrote, how much the Jews resemble them both in doctrine and practice, which detracts from the merits of Josephus' history.

22 This love for the brotherhood, which the Essenes possessed to so extraordinary a degree, was also urged by the Evangelists and Apostles on the early Christians (comp. John xiv. 17; Rom. xiii. 8; 1 Tim. iv. 9; 1 Peter i. 28 xi. 17; 1 John iii. 23; iv. 7, 11; v. 2).

23 This does not contradict Philo's remark (*vide supra* p. 213), as Herzfeld supposes, (*Geschichte des Volkes Israel*, vol. ii. p. 375); since the two statements refer to two different things. The former affirms that they do not receive children into the novitiate, whilst the latter speaks of their adopting and educating them, which is a distinct thing from *becoming a novice*.

24 *Vide supra*, p. 215, note 19.

society as common property,²⁵ so that there is not to be seen among them all, either the abjectness of poverty or the distinction of riches ; but as every man's goods are cast into a common treasury, they all, like brothers, have one patrimony. They regard ointment as defiling ; and if one happens to be anointed against his will, he immediately wipes it off his body.²⁶ To be unadorned but dressed in white they regard as commendable. They have stewards of their common property, appointed by general election, and every one without distinction is proposed for all the offices.

“ § 4. They have no separate city, but some of them live anywhere ; and if any of the society come from other places, whatever they have lies open for them, just as if it were their own ; and they go to those whom they have never seen before as if they had been most intimate. Hence they take nothing with them when they go on a journey,²⁷ but arms for defence against robbers. A steward is appointed in every city of this order to provide strangers with clothes and other necessaries.²⁸ The keeping and appearance of their body are such as of children brought up in fear ; they change neither garments nor shoes till they are worn out or made unfit by time.²⁹ They neither sell nor buy anything among themselves, but everyone gives of that which he has to him that wants, and gets from

25 So our Lord urged on the young man, who lived so exemplary a life in the performance of God's law, and whom he loved, that unless he gave up his property he could not follow him (comp. Matth. xix. 21; Mark x. 21; Luke xviii. 22), and commanded his disciples to sell all their possessions and distribute the money among the poor (comp. Luke xii. 33.)

26 Ointment being a luxury (comp. Eccl. ix. 8; Dan. x. 2), the Essenes regarded the use of it as extravagance, and contrary to the simplicity of their manner of life.

27 The manner in which Christ commanded his disciples to depart on their journey (Mark vi. 8-10) is the same which these pious Essenes are here said to have adopted. This also explains the injunction given by our Saviour to his disciples in Luke xxii. 36, about taking arms with them, which has so greatly perplexed commentators who were unacquainted with the customs of the Essenes.

28 The Pharisees, too, had a steward in every place to supply the needy with clothing and food. (Comp. Pea viii. 7; Baba Bathra 8 a; Sabbath 118.)

29 Comp. also Luke x. 4, &c.

him that which he needs ; and even without requital they can freely take whatever they want.

“ § 5. Their piety towards God is extraordinary, for they never speak about worldly matters before the sun rises, but offer up, with their faces towards it, some of the prayers transmitted by their forefathers, as if they supplicated it to rise.³⁰ Hereupon, they are all sent by the overseers, every one to work in the department in which he is skilled ; and, having diligently laboured till the fifth hour, assemble again together in one place, girt round with their linen apron, and have a baptism with cold water.³¹ After this lustration they resort to a special house, in which no one of another faith is admitted, and go to the refectory purified as into a holy temple.³² Having quietly taken their seats the baker gives every one a loaf of bread according to order, and the cook places before each one a dish with one sort of food. The priest commences with prayer, and no one is allowed to taste his food before grace is said. He also returns thanks after the meal ; for both at the commencement and at the conclusion they praise God as the giver of their food.³³

30 Some translate it “ they offer prayer (*eig τὸν ἥλιον*) to the sun.” But it is utterly inconceivable that the Essenes, who were such thorough Jews, and so exemplary for their adoration of the Holy One of Israel, would be guilty of idolatry by worshipping the sun. Besides, the prayer in question is described as one transmitted by the fathers. And can it be imagined that there existed among the Jews a national prayer to this luminary in direct violation of the first commandment, and of what is so expressly forbidden in Deut. iv. 19 ? The prayer therefore here spoken of is the well known national morning hymn of praise (בָּרוּךְ הוּא יְהוָה) for the return of the light of the day, which still forms a part of the Jewish service to the present day. *Comp. Berachoth 9 b ; Rappaport in the Bikure Ha-Ittim*, vol. x., Vienna 1829, p. 115, and *infra* p. 245.

31 This practice of bathing before meals was also common among the Pharisees (comp. *Chagiga*, 18, b), and as the Essenes covered themselves with their aprons so the Pharisees put on their *Talith* during their baptisms. (*Comp. Berachoth* 24, b.)

32 The Pharisees, too, regarded the refectory as a sanctuary, and compared its table to the altar in the temple, because the altar in the temple is represented as the table of the Lord (Ezekiel xli, 22). Hence, R. Jochanan and R. Eleazar remark—“ As long as the temple stood the altar atoned for the sins of Israel, but now it is man’s table which atones for his sins.” (*Talmud Berachoth*, 55a). Hence the Chaldee paraphrase of Ezekiel xii. 22, and the remarks of Rashi and Kimchi on this passage, which cannot be understood unless this traditional interpretation is borne in mind. *Comp. also Aboth* iii, 3.

33 This was also the practice of the Pharisees, and is to the present day the custom among the orthodox Jews.

Whereupon they put off their white garments as if they were sacred, and betake themselves again to their work till evening. On returning again they take their supper together, at which strangers, who happen to be in the place, are allowed to sit down with them. No noise or tumult ever desecrates their house, but they let every one take part in the conversation in turn ; and the silence of those who are within appears to those that are without as some awful mystery. The cause of this is the uninterrupted sobriety, as well as the fact that their eating and drinking are so measured out as just to suffice the cravings of nature.

“ § 6. Whilst they do nothing without the injunctions of their overseers, yet there are two things in which they have free action, viz., helping the needy, and shewing mercy ; to help the deserving when they are in want, and to give food to the hungry, they have perfect liberty ; but to give anything to their relations they are not allowed without the permission of the overseers. They are just dispensers of their anger, curbers of their passions, representatives of fidelity, ministers of peace ; and every word with them is of more force than an oath. They avoid taking an oath, and regard it as worse than perjury ; for they say that he who is not believed without calling on God to witness is already condemned of falsehood.³⁴ They take extraordinarily great pains in studying the writings of the ancients, and select that especially which is beneficial both for the soul and body ; hence they investigate medical roots and the property of minerals for the cure of distempers.³⁵

“ § 7. When any one desires to enter the sect, he is not immediately admitted, but although he has to remain a whole

34 This paragraph almost embodies the sentiments uttered by our Saviour in Matth. chap. v.

35 These ancient books on magical cures and exorcisms were the reputed works of Solomon, who, according to the Talmud as well as the Byzantine and Arabian writers, composed treatises on miraculous cures and driving out evil spirits. (Comp. *Pesachim* 56 a; *Fabricius, Codex pseudepigraphus Vel. Test.* p. 104², &c.; *Weil, Biblische Legenden der Muselmänner*, p. 225-279). Josephus tells

year without, yet he is obliged to observe their ascetic rules of living, and they give him an axe, an apron as mentioned above, and a white garment.³⁶ If he has given proof of continence during this time, he approaches nearer to their life and partakes of the holier water of purification ; but is still not as yet admitted to their common table. Having thus given proof of his perseverance, his conduct is tested two more years, and, if found worthy, he is admitted into the society. But before he touches the common meal, he swears, by most awful oaths,³⁷ first to fear God, and next to exercise justice towards all men—neither to wrong any one of his own accord nor by the command of others ; always to detest the wicked and side with the righteous ; ever to keep faith inviolable with all men, especially with those in authority, for no one comes to office without the will of God ;³⁸ not to be proud of his power nor to outshine his subordinates, either in his garments or greater finery, if he himself should us elsewhere that some of these Solomonic productions still existed in his own days, and that he had actually seen demons driven out and people cured by their aid. (*Comp. Antiq.* book viii. chap. ii. § 5.) This account most strikingly illustrates what Christ says in Matth. xii. 27.

36 This custom has its origin in the extension of a Mosaic law. The hosts of the Lord are commanded in Deut. xxiii 13, 15, to have spades among the martial instruments in order to bury therewith their excrements without the camp, and thus to keep themselves pure from every pollution, and to be a holy camp, because the Holy One of Israel dwells in the midst thereof. Now as the Essenes strove to be, in a pre-eminent sense, the spiritual hosts of the Lord, every one of them was obliged to have this spade in order to guard their sacred camp from defilement. For this reason the apron was also given to cover their nakedness in their numerous baptisms, and thus to keep their thoughts from dwelling upon anything which might lead to impurity ; whilst the white garment was the symbol of their holiness. This, however, was not peculiar to the Essenes, as the Talmud tells us that when any one applied to become a member of the Pharisaic order (הַבָּבָר), he had to pass through a novitiate of twelve months, at the expiration of which he received a sort of garment called נִנְצָבָה, and having duly qualified himself in this stage, he was afterwards admitted to the holier lustrations (מִקְבָּלָה). (*Comp. Tosifta Demai* e. 11 ; *Jerusalem Demai* ii. 3 ; *Babylonian Becharoth* 30, 6).

37 This was the only occasion on which the Essenes were permitted to take an oath.

38 This does not refer to governments generally, as Gfrörer will have it (*Philo und die jüdisch-alexandrinische Theosophie*, vol. ii, p. 333, &c.), but to the office of overseer or steward *among the brotherhood*, as is evident from the immediately following statement, which most unquestionably pledges every Essene to retain his simplicity of character if he should ever attain to any official position or stewardship in the order.

attain to office ; always to love truth and strive to reclaim all liars ; to keep his hands clear from stealing, and his mind from unholy gain ; not to conceal anything from the brotherhood, nor disclose anything belonging to them to those without, though it were at the hazard of his life. He has, moreover, to swear not to communicate to any one their doctrines in any other way than he has received them;³⁹ to abstain from robbing the commonwealth ; and equally to preserve the writings of the society and the names of the angels.⁴⁰ By such oaths they bind those who enter the brotherhood.

“ § 8. Such as are caught in heinous sins are excommunicated from the society ; and the excommunicated frequently die a miserable death. For, being bound by oaths and customs, they cannot receive food from any out of the society, so that they are forced to eat herbs till, their bodies being famished with hunger, they perish.⁴¹ Hence they compassionately receive many of them again when they are at their last gasp, thinking that suffering, approaching unto death, is sufficient for their sins.

“ § 9. In their verdicts they are most exact and just, and never give sentence if there are less than a hundred of the

39 This is not peculiar to the Essenes. The Pharisees, too, would not indiscriminately propound the mysteries of the cosmogony and the theosophy, which, according to them, are contained in the history of the Creation and in the vision of Ezekiel, except to those who were regularly initiated in the order. Comp. Mishna Chagiga, ii, 1.

40 This evidently refers to the secrets of the *Tetragrammaton*, and the angelology which played so important a part among the Jewish mystics from time immemorial. Comp. Wisdom of Solomon vii. 20 ; Mishna Chagiga, ii, 1.

41 The reason why he ate herbs and not bread, or the simple dish which the order generally took, is that, being bound by an oath to observe the practices of the brotherhood, he could only accept meals from those who lived according to the highest degree of purity (*צְבָרָה צְבָרָה*), and who, as a matter of course, kept their meals according to this degree. But as such a mode of life was of very uncommon occurrence, the excommunicated Essene was obliged to live on herbs or vegetables which he had to pluck himself ; for, according to the Talmud, plants are only then considered unclean when they are *cut off* and water is poured upon them (*כַּשְׁחַוְנָשָׁרְוּ לְקָבֵל וּמְכַאַכְלָנְלָשָׁו*). As for Josephus' saying that he died a miserable death, and that he could only eat *grass* (*ποιηφάγων*), this is simply another instance of his exaggerating and colouring his subject.

brotherhood present: but what is then decreed is irrevocable. Next to God they have the highest veneration for the name of the lawgiver, Moses, and punish with death any one who blasphemers it. To submit to the elders and to the majority they regard as a duty: hence, when ten of them sit together, no one will speak if the other nine do not agree to it. They avoid spitting before the face, or to the right hand,⁴² and are also stricter than all other Jews not to touch any labour on the Sabbath day—for they not only prepare their Sabbath-day's food the day before, that they may not kindle a fire on that day, but they will not move a vessel out of its place⁴³ nor go to ease nature. On all other days they dig a pit of a foot deep with the spade (such an one being given to the novice), and having covered it all round with a cover, that it may not offend the Divine rays, they set themselves over it, and then put the earth that was dug out again into the pit; and do this, after having chosen the most lonely places. And although the voiding of bodily excrements is natural, yet it is their custom to bathe after it, as if they had been defiled.⁴⁴

“ § 10. They are divided, according to the time of leading this mode of life, into four different classes, and the juniors are so much inferior to the seniors, that the latter must wash themselves when they happen to touch the former, as if they had been defiled by a stranger.⁴⁵ They live to a great age, so

42 The Pharisees, too, regarded ten persons as constituting a complete number for divine worship, held the assembling of such a number as sacred, and would not spit in their presencee. (*Comp. Berachoth 54 a; Jerusalem Berachoth iii. 5; Aboth iii. 6.*)

43 This is not peculiar to the Essenes; for the Pharisees, too, would not remove a vessel on the Sabbath (*comp. Tzitzit u Succa*, iii); and the orthodox Jews, to the present day, will not even carry a handkerchief on the Sabbath; they tie it round the body to serve as a girdle, so that it might not be said that they carry the weight of even so small a thing on the sacred day. *Comp. also Mark xi, 16.*

44 Neither is this peculiar to the Essenes; for not only did the Pharisees of old do the same (*comp. Ioma 28, a*); but the orthodox Jews of the present day wash after performing the duties of nature.

45 This division of the brotherhood into four classes, as well as the impurity contracted by the higher class when touching one who belonged to a lower class of purity, also existed among the Pharisees. (*Vide supra*, p. 183, note 1.)

that many of them live to above a hundred years—arising from the simplicity of their diet, as it appears to me, and from their order. They despise suffering, and overcome pain by fortitude. Death, if connected with honour, they look upon as better than long life. Of the firmness of their minds in all cases the war with the Romans has given ample proof; in which, though they were tortured, racked, burned, squeezed, and subjected to all the instruments of torment, that they might be forced to blaspheme the lawgiver or eat what was forbidden, yet they could not be made to do either of them; nor would they even once flatter their tormentors or shed a tear, but, smiling through their torments and mocking their tormentors, they cheerfully yielded up their souls, as those who would soon receive them back again.⁴⁶

“ § 11. For they firmly believe that the bodies perish and their substance is not enduring, but that the souls are immortal—continue for ever and come out of the most subtile ether—are enveloped by their bodies, to which they are attracted through a natural inclination, as if by hedges—and that when freed from the bonds of the body, they, as if released from a long servitude, rejoice and mount upwards. In harmony with the opinion of the Greeks,⁴⁷ they say that for the good souls there is a life beyond the ocean, and a region which is never molested either with showers or snow or intense heat—is always refreshed with the gentle gales of wind constantly breathing from the ocean; whilst to the wicked souls they assign a dark and cold corner, full of never-ceasing punishments. And it seems to be according to the same opinion that the Greeks assigned to their valiant men, whom they called heroes and demigods, the Island of the Blessed, but to the souls of the wicked the regions of the impious in Hades;

46 Philo, too, speaks of this fact. (*Vide supra p. 212*)

47 This is another instance of the anxiety of Josephus to make the different phases of Judaism harmonise with the Greek mode of thinking.

as also their fables speak of several there punished, as Sisyphus and Tantalus and Ixion and Tityus. This they teach, partly because they believe that the souls are immortal, and partly for the encouragement of virtue and the discouragement of vice. For good men are made better in their lives by the hope of reward after their death, whilst the passions of the wicked are restrained by the fear they are in that, although they should be concealed in this life, after death they must suffer everlasting punishment. This is the doctrine of the Essenes about the soul—possessing thereby an irresistible bait for those who have once tasted their philosophy.

“§ 12. There are also some among them who undertake to foretell future events, having been brought up from their youth in the study of the sacred Scripture, in divers purifications, and in the sayings of the prophets; and it is very seldom that they fail in their predictions.

“§ 13. There is also another order of Essenes who, in their way of living, customs, and laws exactly agree with the others, excepting only that they differ from them about marriage. For they believe that those who do not marry cut off the principal part of human life—that is, succession—especially that, if all were of the same opinion, the whole race would soon be extinguished. They, however, try their spouses for three years, and after giving evidence, by three natural purgations, that they are fit to bear children, they marry them. They have no connubial intercourse with them when with child, to show that they do not marry to gratify lust, but only to have children. The women, too, have their garments on when they have baths, just as the men have on their aprons. Such are the customs of this brotherhood.”

The next mention which Josephus makes of them is in his Antiq. Book xiii. chap. v. § 9, and is as follows:—

“§ 9. At this time [166 B.C.] there were three sects (*αιρέσεις*)

among the Jews, differing in their opinion about human affairs. The first was called the sect of the Pharisees, the second the sect of the Sadducees, and the third the sect of the Essenes. The Pharisees affirm that some things only, but not all, are the work of fate ($\tauῆς εἰμαρμένης$), and some are in our own power, whether they should take place or whether they should not occur ; the sect of the Essenes maintain that fate governs all things,⁴⁸ and that nothing can befall man contrary to its determination and will ($\psiῆφος$) ; whilst the Sadducees reject fate, saying that there is no such thing, and that human events do not proceed from it, and ascribe all to ourselves, so that we ourselves are the cause of our fortunes, and receive what is evil from our own inconsiderateness. However, I have given a more minute description of this in the second book of the Jewish War."

He speaks of them again in Antiq. Book xv. chap. x. § 4, towards the end, and § 5, as follows :—

"§ 4. The Essenes, as we call them, were also exempted from this necessity [of taking an oath of allegiance to Herod]. These men live the same kind of life which among the Greeks has been ordered by Pythagoras.⁴⁹ I have discoursed more fully about them elsewhere. The reason, however, why Herod had the Essenes in such honour, and thought more highly of them than of mortal nature, is worthy of record. For this account, too, is not unsuitable for this history, inasmuch as it shows the people's opinion about the Essenes.

"§ 5. There was a certain Essene, named Menahem (*Μενάχμος*

48 It is evident that Josephus, as an orthodox and pious Jew, cannot mean by *εἰμαρμένη* the *Fatum* of the Stoics, which was above the deities ; but intends to convey thereby the idea of *eternal counsels* and *predestination* spoken of in the Bible. Indeed, elsewhere Josephus tells us distinctly that "the doctrine of the Essenes delights to leave all things to God" (*vide infra p. 228*) ; so that that which is in the one case ascribed to *fate*, is in the other ascribed to *God*.

49 No more regard is to be paid to this remark, that the Essenes are like the Pythagoreans, than to the assertion which Josephus makes afterwards that they are related in their manner of life to the Polistae, (*vide infra p. 229*), as his aim was to shew how much the Jewish sects resembled the Greek systems of philosophy. Comp. p. 217 note 21.

—(מִנְחָם) who was celebrated not only for the uprightness of his conduct, but also for the fore-knowledge of the future proceeding from God. When he once saw Herod, as a boy going to school, he addressed him by the name of 'King of the Jews.'⁵⁰ Herod thought that he did not know him or that he jested, and reminded him that he was of common origin. But Menahem smiled on him most friendlily, clapped him on the back with his hand, and said—'Thou wilt, nevertheless, be king, and wilt begin thy reign happily, for God has found thee worthy of it. And remember the blows that Menahem has given thee, as being the symbol of the change of thy fortune. For this assurance will be salutary for thee when thou wilt love justice and piety towards God and equity towards thy citizens. However, I know that thou wilt not be such a one, for I can perceive it all. Thou wilt, indeed, excel more than any one in happiness, and obtain an everlasting reputation, but thou wilt forget piety and justice. This will not be concealed from God, for he will visit thee with his wrath for it, towards the end of thy life.' Herod paid very little attention to it at that time, as he had no hope of it. But as he soon afterwards advanced to the dignity of king and was happy, he ordered Menahem to come to him in the height of his dominion, and asked him how long he should reign; but Menahem did not tell him. Seeing that he was silent, he asked again whether he should reign ten years. Whereupon he replied, 'Yes; twenty, nay, thirty years;' but did not determine the exact limit of his reign. Herod, rejoicing on it, gave Menahem his hand and dismissed him, and from that time continued to honour the Essenes. I thought of relating this to the readers (though to some it may seem incredible), and of making

50 The fact that Menahem saw Herod in Jerusalem, and that the Essene Judah, as Josephus tells us elsewhere (*comp. Jewish War*, book i. chap. iii. § 5; *Antiq.* book xiii. chap. xi. § 2), foretold in the temple the death of Antigones, clearly shows that the Essenes did not at first form a separate community, but lived together with the rest of their Jewish brethren.

it known, as it concerns us, because many of the Essenes are highly esteemed for their virtuous conduct and knowledge of Divine things."

Josephus also relates instances in which Essenes foretold future events, in *Antiq.*, book xviii., chap. ii., § 2; book xviii., chap. xiii. § 3; and *Jewish War*, book 1, chap. iii., § 5.

The last account which Josephus gives us is to be found in his *Antiq.*, book xviii., chap. i., § 2 and 5.

"§ 2. There have been three philosophies among the Jews ever since the ancient time of the fathers (*ἐκ τοῦ πάνταρχαίον τῶν πατρίων*), that of the Essenes, and that of the Sadducees, and a third which the so-called Pharisees followed. Although I have already spoken of them in the second book of the *Jewish War*, yet will I mention here also something about them.

"§ 5. The doctrine of the Essenes delights in leaving all to God (*Θεῷ καταλιπεῖν φιλεῖ τὰ πάντα*). They regard the soul as immortal, and say that the attainment to virtue must be fought for with all our might. Although they send consecrated gifts to the Temple, yet they never bring any sacrifice on account of the different rules of purity which they observe; hence, being excluded from the common sanctuary, they offer sacrifices in themselves (spiritually). Otherwise, they are in their manner of life the best of men, and employ themselves wholly in the labour of agriculture. Their uprightness is to be admired above all others who endeavour to practice virtue; such uprightness, which is by no means to be found among the Greeks and foreigners, is not of recent date, but has existed among them from times of yore (*ἐκ παλαιῶν*), striving most scrupulously not to disturb the community of goods, and that the rich should not enjoy more of the common property than the poor. This is the conduct of this people who are more than four thousand in number. They never marry wives, nor endeavour after the possession of property;

for they believe that the latter leads to injustice, and the former yields opportunities for domestic discord. Living by themselves they serve each other. They choose good men, who are also priests, to be the stewards of their incomes and the produce of the fields, as well as to procure the corn and food. They do not differ at all in their living, but are more like those whom the Dacae call *Polistae*."

We notice next the account of Caius Julius Solinus, the author of the Geographical compendium called *Polyhistor*, who flourished about 238 A.D. His accounts, which are to be found in chap. xxxv. § 7-10 of his work, are evidently derived from Pliny.

" In the interior of Judea, towards the west, are the Essenes, who differ from the usages of all other nations in their marvellous constitutions, and who, according to my opinion, have been appointed by divine providence for this mode of life. No woman is to be found there; connubial pleasures they have entirely renounced; money they know not, and palm-berries are their food.⁵¹ Not a single birth takes place there, and yet there is no want of population. The place itself is devoted to modesty. Although a very large number of persons run to it from all quarters, yet none is admitted who is not thought to possess purity, fidelity and innocence; for, if one has been guilty of the slightest misdemeanour, though he endeavour to obtain admission by offering never so large a fortune, he is excluded by a divine decree. Thus it is that through an immense space of ages (*per immensum spatium saeculorum*), incredible to relate,⁵² this society is perpetuated though no child is born among them."

51 Pliny, whom Solinus copies, simply says that the Essenes live in the society of palm-trees (*socia palmarum*), to form an antithesis with the appellation *a solitary community* (*sola gens*); and this is perfectly correct. But Solinus' alteration of it into "palm-berries are their food" (*palmis victitant*) is incorrect, inasmuch as they lived from the cultivation of the land, bees, &c.

52 This is simply a reiteration of what Pliny says about the antiquity of the Essenes.

The next account is that of Porphyry, the neo-Platonic philosopher and celebrated antagonist of Christianity, who was born 233 A.D. and died about 306 A.D. His description of the Essenes, which is given in his treatise *On the Abstinence from Animal Food* (*Lugduni ap. Morillon*, 1620, p. 381, &c.), is, as he himself tells us, taken from Josephus. He has, however, made some alterations, as may be seen from the following :

“ There were three sorts of philosophers among the Jews, the first were headed by the Pharisees, the second by the Sadducees, and the third, who seemed the most honourable (*σεμνοτάτη*), by the Essenes. The latter formed such a society as Josephus has described it in different parts of his works, as well as in the second book of the Jewish History, which he composed in seven books, as in the eighteenth book of his Antiquities, which he composed in twenty books, and in the second part to the Greeks.⁵³ ”

“ The Essenes are Jews by birth, and love one another more than other people. They avoid sensual enjoyments as vices, and regard continence and the power to resist the passions as the first virtue ; they despise marriage and adopt the children of strangers, whilst still young and suitable for instruction, regard them as their own, and train them in their usages. They do not repudiate matrimony and child birth in themselves, but they guard against the sensuality of women. They despise riches, and there is a wonderful community of goods among them. There is no one found among them who occupies a distinguished position through his wealth ; for they have a law that those who enter the society give up their possessions to the brotherhood, so that there is no such thing among them as abjectness of poverty or arrogance of riches ; but the possessions of all put together form a fraternal and common property. If one of them happens to be inadver-

53 This work of Josephus, addressed to the Greeks, is no longer extant.

tently anointed, he immediately washes his whole body ; for they regard it as praiseworthy to have a dry skin, and they are always dressed in white. They appoint stewards to manage their common property ; and every one, without distinction, is eligible for all the offices.

“They are not confined to one city, but live in different places, and everything they have is at the service of the members who happen to come from another city. Though meeting for the first time they at once salute each other as intimate friends (*ἴσασιν ὥσπερ συνήθεις*) ; hence they travel without taking anything with them. They do not change either garments or sandals till they are torn or worn out by age ; they neither buy nor sell, but every one gives of that which he has to him that wants it, and receives that which he needs ; but even without receiving anything in return they freely communicate to him that wants. Their piety towards God is extraordinary. None of them speak about anything profane before the sun rises ; but they offer to it some of the prayers transmitted to them by their forefathers, as if they supplicated it to rise, &c., &c.” He repeats almost literally the whole of § 5 of Josephus *On the Jewish War*, book ii. chap. viii., which we have given above, p. 219.

Porphyry omits § 6 of Josephus, but gives, with a few verbal alterations, both the whole of § 7, which describes the admission into the order, and § 8, which describes the punishment. He omits the greater part of § 9, and adds the following statement, which is not to be found in Josephus. “Their food is so poor and scanty that they do not require to ease nature on the Sabbath,⁵⁴ which they devote to singing praises to God and to rest.” He omits from § 10 the description of the division of the Essences into four classes, and

⁵⁴ This is simply imaginary ; the real reason for it was, that they could not dig on the Sabbath the hole that was requisite for it without, as they thought, violating the sanctity of the day, as to do so was considered a labour.

simply mentions firmness in suffering and death. He also omits from § 11 the whole piece beginning with the words “In harmony with the opinion of the Greeks, &c. ;” whilst he not only gives the whole of § 12, but has also the following addition, “With such a manner of life, and with their firm adhesion to truthfulness and piety, there are naturally many among them who can foretel future events, &c. ;” and concludes with the words, “This is the nature of the order of the Essenes among the Jews,” omitting altogether what Josephus says in § 13 about those Essenes who marry.

Epiphanius, bishop of Constantia and metropolitan of Cyprus, who was born in Bezanduca, a small town of Palestine, in the first part of the fourth century, and died in 403, has also given us some brief notices of the Essenes in his celebrated work *Against the Heretics*. His first notice is to be found in *Adver. Haer.*, lib. i. ord. x. p. 28, ed. Col., 1682, under the title *Against the Essenes and the Samaritans*, and is as follows :

“ The Essenes continue in their first position, and have not altered at all. According to them there have been some dissensions among the Gorthenes, in consequence of some difference of opinion which has taken place among them—I mean among the Sebuens, Essenes and Gorthenes. The difference of opinion relates to the following matter. The law of Moses commands the Israelites of all places to come up to Jerusalem to the three festivals, viz., the feasts of the Passover, Pentecost and Tabernacles. As the Jews in Judea and Samaria were largely dispersed, it is supposed that those of them who made their pilgrimage to Jerusalem went through Samaritan cities, and as the Samaritans assemble at the same time to celebrate the festivals, a conflict arose between them.”

Epiphanius speaks of them again (*Adv. Haer.*, lib. i. ord. xix. p. 39), and under the title, *Against the Ossenes* (*κατὰ Οσσηνῶν*), as follows :

“ Next follow the Ossenes, who were closely connected with the former sect. They too are Jews, hypocrites in their demeanour, and peculiar people in their conceits.⁵⁵ They originated, according to the tradition which I received, in the regions of Nabatea, Itruria, Moabitis and Antilis, (Αρηιλίτις), in the surrounding neighbourhood of the so-called Dead Sea.

. . . The name Ossenes, according to its etymology, signifies *the stout race* (*στιβυρὸν γένος*). . . . A certain person named Elxai joined them at the time of the Emperor Trajan, after the advent of the Saviour, who was a false prophet. He wrote a so-called prophetical book, which he pretended to be according to divine wisdom. He had a brother named Jeeus, who also misled people in their manner of life, and caused them to err with his doctrine. A Jew by birth, and professing the Jewish doctrines, he did not live according to the Mosaic law, but introduced quite different things, and misled his own sect. . . . He joined the sect of the Ossenes, of which some remnants are still to be found in the same regions of Nabatea and Perea towards Moabitis. These people are now called *Simseans*.⁵⁶

“ But hear the Sadducee’s nonsense (*comp. ibid.*, p. 42) : he rejects the sacrificial and altar services, as repulsive to the Deity, and as things which, according to the meaning of the fathers and the Mosaic law, were never offered to the Lord in a worthy manner. Yet he says that we must pray with our faces to Jerusalem, where the sacrificial altar and the sacrifices have their place. He rejects the eating of animal flesh which is common among the Jews, and other things ; nay, even the sacrificial altar and the sacrificial fire, as being foreign to the

55 This unjust remark about the Essenes, whose exemplary virtues and self-denying life elicited the unqualified admiration of Jews, Greeks, and Romans, is just what might be expected from the bigoted persecutor of heresies, amongst whom he put no less a person than St. Chrysostom.

56 This name may be derived from the Hebrew *Shemesh* (שֶׁמֶשׁ) *sun*, and was most probably given to the Essenes, because of the erroneous notion that they worshipped *the sun*.

Deity. The purifying water, he says, is worthy of God, but the fire is unworthy, because of the declaration of the prophet: 'Children, go ye not there to see the fire of the sacrifices, for ye err; yea, it is already an error to think such a thing.' 'If you look at the fire very closely,' says he, 'it is still far off. Moreover, go ye not to look at the sacrificial fire, but go ye rather to the doctrine of the water.' There is much more of such idle talk to be found among the Ossenes.⁵⁷

These are the sources from which writers upon the Essenes have, till within very lately, drawn their information. As to the account of Eusebius (*comp. Hist. Ecclesiast., lib. ii, cap. xvii*), to which appeal is often made, it is nothing but a Christianized reproduction of the so-called Philonic description of the Therapeutae. It would therefore be useless to give it. In looking through these accounts, it will be seen that there are only three independent ones among them, namely—Philo's, Josephus's and Pliny's; as the notice of Solinus is merely a repetition of Pliny, the description of Porphyry is almost a literal reproduction of Josephus; whilst the distorted scraps of Epiphanius are not only worse than useless, but are unworthy of him, and the account of Eusebius is simply misleading, inasmuch as it is a repetition of an apocryphal story, which has nothing to do with the Essenes.

57 The whole of this account is worse than useless, inasmuch as it not only gives us no information whatever about this interesting order, but is positively misleading.

III.

Having given the ancient documents, all that now remains is that I should give a brief sketch of the most important modern literature on the Essenes. In doing this part of my task, as in the former, I shall try as much as it is possible to follow the chronological order.

1513-1577.—Accordingly De Rossi occupies the first position. In his erudite work, called *Meor Enajim*, i.e., *The Light of the Eyes*, which is a Cyclopædia of Biblical literature and criticism, this profound critic gives us a brief notice of this brotherhood, in which he maintains that the Essenes are identical with the Greek sect called *Baithusians* in the Talmud, and *Therapeutae* by Philo. His account is as follows : “ It has often appeared to me strange that the Talmud should say nothing whatever about that sect which obtained a good report among the nations. I therefore examined the works of our sages, to ascertain whether I could find in them any distinction made between the Sadducees and the Baithusians. And it appeared to me that though both alike denied the traditional law **התורה שעל פה** (, yet the Baithusians are no where charged with the sin of denying, like the Sadducees, the immortality of the soul and future judgment. Moreover, I thought of the similarity of the names Baithusians and Essenes **(ביתוסים איסיאי)** (, and especially of the manner in which the ancients changed names. Now, owing to the word **בית** being so frequently found prefixed to names of schools and families, the appellation **ביתוסים** might easily have originated from a junction of the words **בית איסיאי** (. I also saw the passage in the Talmud, Sabbath, cap. viii, fol. 108, as quoted also in Sopherim, cap. i, which is as follows :—‘ A Baithusian

asked R. Joshuah whence do we know that phylacteries must not be written upon the skin of an unclean animal ? To which he replied—‘ It is written that the Lord’s law may be in thy mouth, (Exod. xiii, 9) this signifies that phylacteries must be written upon the skin of an animal which thou canst take into thy mouth, i.e., eat.’ To this he said—‘ This being the case, we must also not write the phylacteries upon the skin of an animal which died ; [for an Israelite is as much forbidden to taste the flesh of it, as to eat an unclean animal.] Hereupon the Rabbi replied—‘ I will tell thee a parable, to make the thing clear. Two men are condemned to death : the one the king kills, and the other is killed by the executioner : now, which of the two dost thou esteem higher ? Surely the one whom the king himself has executed. So the animal which died, [i.e., which the King of Kings caused to die] must be preferred to the others.’ Whereupon the Baithusian said—‘ Accordingly, we ought also to eat it.’ R. Joshuah replied—‘ The Bible prohibits it (Deut. xiv), and dost thou want to eat it ?’ The Baithusian then said—**קלוס**, This expression Rashi of blessed memory rightly says is Greek ; i.e. *καλὸν*.¹ Hence it is to be inferred that the Baithusian was a Greek ; and, indeed, we know from Philo and Josephus that the Essenes were also Greek Jews, living in Alexandria. . . . From all these things I easily quieted my mind, and concluded that the Baithusians are the same as the Essenes.’ Now, from a careful perusal of the account given by Josephus of the Essenes, it will be seen that he never describes them as Greek Jews. Besides, this is utterly at variance with ancient tradition, as the Talmudic authorities most positively declare that the Baithusians and Sadducees were both alike in doctrine, that both derived their names from the founder of these sects, Baithos (**ביתוס**) and Zadok (**צדיק**), the disciples of Antigonus of Soho, and that they gave rise to these sects, through mis-

¹ Comp. *Meor Enajim*, edit. Mantua. 1547, fol. 33 b.

interpreting the following saying of their master² which he had received from Simon the Just :—“ Be not like servants who serve their master for the sake of receiving a reward, but be ye like servants who serve their master without the view of receiving a reward,” recorded in Aboth. i. 3. Upon this Aboth d. R. Nathan (cap. v.) remarks, “ Antigonus’ two disciples at first continued implicitly to teach this saying to their disciples, and these again to their disciples. At last, however, they began to ponder over it, and said—‘ What did our fathers mean by this saying ? Is a labourer to labour all day and not receive his wages in the evening ? Now if our fathers had believed that there is another world, and a resurrection of the dead, they would not have spoken thus.’ Hence they dissented from the law, and from them originated the two sects, the Sadducees and the Baithusians, the Sadducees from Sadok and the Baithusians from Baithus. They used gold and silver vessels all the days of their life, not because they were proud, but because they said that the Pharisees themselves have a tradition that they afflict themselves in this world, and have nothing in the world to come.” From this we see that 1. The Baithusians, like the Sadducees, derived their appellation from the proper name of their founder, which is *Baithus* so that the first part of the name **בית** cannot be separated from it. 2. Like the Sadducees, the Baithusians denied the immortality of the soul and the existence of angels, whereas the Essenes firmly believed in the immortality of the soul, and made the angels play a very important part in their creed. That the Sadducees and the Baithusians were considered to be identical, or, at all events, to

² אנטיגונוס איש סוכו קבל ממשמען הזריק הוא אמר אל ההיו כעבדים המכששים את הרב על מנת לא לתקן פרם אלא היי כעבדים המשמשים את הרב שלא על מנת לא לתקן פרם וזה מורה שמשם עליים כי טהויה שכבים כפול לעתיד לנו : אנטיגונוס איש סוכו היו לו שני תלמידים שהיו שוני בדבריו שוני הוא להלמורים והלמידים להלמידיהם פמדו ודרקו אחריו אמרו כה ראו אבותינו לומר אבストר שיעשה פועל מלאכה כל היום ולא יישל שנו רבת אליא יודהין אבותינו שיש השלום אחר ויש היהת המיחס לא היו אומרים כך עמדו וזרשו מי ההורה ונפרשו ממה שחי פרצחות צדוקים וביתוסון צדוקים על שם צדוק ביתוסון על שם שהיה מטהמתש בכלים זהב וככל נסכך כל ימי לא היהת דעתו נסה עליו אלא צדוקים אומרים מסורה בית פרושים שן מצערן עצמן בעולם זה ונעלם הבא אין להם כלום :

hold similar doctrines is also evident from the fact that what is in one place of the Talmud ascribed to the former, is in another place ascribed to the latter. Thus, for instance, in Sucea 48 *b.* the Sadducees are said to have questioned the necessity of bringing a libation of water on the Feast of Tabernacles ; in Tosifta Succa cap. iii. it is ascribed to the Baithusians. In Maccoth, 5, *b.* Chagiga, 16 *b.* it is said that the Sadducees urged that a false witness should only then be executed if the individual whom he had falsely accused had already been executed ; in Tosifta Sanhedrin, cap. vi. the same thing is ascribed to the Baithusians. According to Joma, 19 *b.* 53 *a.* the Sadducees would have it that the High Priest should put the incense on the fire outside the Sanctuary on the great Day of Atonement, in Tosifta Joma, cap. 1, and Jerusalem Joma, i. 5, this is also ascribed to the Baithusians. Comp. also 115, *b.*, Megillath Taanith, cap. vi., with Tosifta Jadajim cap ii. And 4. The Baithusians are constantly spoken of as heretics and false witnesses (*comp. Jerusalem Rosh Ha-Shana*, ii, 1 ; *Babl. ibid.* 226), which is utterly at variance with the high character given to the Essenes even by those who belonged to opposite sects.

1587-1643.—Our learned countryman, Dr. Thomas Godwyn occupies the next position. In his interesting and erudite volume, entitled *Moses and Aaron* : which was first published in London 1625, Godwyn devotes *the twelfth chapter of the first book* to the Essenes. The etymology of this name he takes to be the Syriac **KNK** to heal, to cure diseases, and submits that they were called **ESSENES** = *θεραπευται physicians*, because they cultivated the study of medicine. His summary of their doctrines and practices is made from Josephus' description of them as well as from Philo's reputed account of the *Therapeutae* which has nothing to do with the Palestinian Essenes. Godwyn also gives a number of supposed parallels between the doctrines and practices of

Essenism and Pythagorism. He does not attempt to account for these resemblances, nor does he try to trace the origin of the brotherhood. He is, however, certain that they existed in the time of Judas Maccabæus and "continued until the day of our Saviour and after; for Philo and Josephus speak of them as living in their time." He assigns the following reasons for their not being mentioned in the New Testament. 1. Their being small in number. 2. "They were peaceable and quiet, not opposing any; and therefore not so liable to reproof as the Pharisees and Sadducees, who opposed each other, and both joined against Christ." 3. They were passed over in silence in the New Testament just "as the Rechabites in the Old Testament, of whom there is mention only once and that obliquely, although their order continued about three hundred years, before this testimony was given of them by the Prophet Jeremiah." And 4. "Though the name of the *Essenes* be not found in Scripture, yet we shall find in St. Paul's Epistles many things reproved, which were taught in the school of the Essenes. Of this nature was that advice given unto Timothy:—' *Drink no longer water, but use a little wine.*' (1 Tim. v. 23). Again, '*Forbidding to marry, and commanding to abstain from meats is a doctrine of devils*' (1 Tim. iv. 3); but especially *Colossians* ii., in many passages the Apostle seemeth directly to point at them, 'Let no man condemn you in meat and drink' (verse 16): 'Let no man bear rule over you, by humbleness of mind and worshipping of angels' (verse 18) 'Why are ye subject to ordinances (*τι δογματιζεσθε* verse 20)?' The Apostle useth the word *δόγματα* which was applied by the Essenes to denote their *ordinances aphorisms* or *constitutions*. In the verse following he gives an instance of some particulars, '*Touch not, taste not, handle not*' (ver. 21). Now the junior company of Essenes might not *touch* the seniors. And in their diet their taste was limited to bread, salt, water

and hyssop. And these ordinances they undertook *διὰ πόθου σοφίας* saith Philo, *for the love of wisdom*; but the Apostle concludeth (ver. 23) that these things had only *λόγου σοφίας* a show of *wisdom*. And whereas Philo termeth the religion of the Essenes by the name of *Θεράπεια* which word signifieth *religious worship*; the Apostle termeth in the same verse *εθιλεθρεκείαν* *voluntary religious worship* or *will worship*; yea, where he termeth their doctrine *πάτρων φιλοσοφίας* a kind of *philosophy received* from their forefathers by tradition; St. Paul biddeth them beware of *philosophy* (ver. 8)." I have given this extract in full because succeeding writers have with more or less exactness based their opinion upon it. In animadverting upon it, I need only refer to the former part of this Essay, where it will be seen that some of the things here mentioned, are not peculiar to the Essenes, and others do not belong to them at all, whilst the last quotation from Philo describes the *Therapeutae* and not the Essenes.³

1628-1678.—Next in point of time is Theophilus Gale, who gives us a description of the Essenes in his famous work called *The Court of the Gentiles*, part ii. (Oxford, 1671), book ii. § 9, p. 146-156. As might be expected from this learned writer, who wrote this elaborate work to demonstrate that "the original of all human literature, both philology and philosophy, is from the Scriptures and the Jewish Church," he endeavours to prove that Pythagoras took the whole of his philosophic system from the Essenes. "As for the origination of their name," Gale tells us, "they were called חסדים i.e. according to the Greek καθαροὶ and according to our English dialect *pure*. Now the origination or rise of these Essenes I conceive (by the best conjectures I can make from antiquity), to be in or immediately after the Babylonian captivity (though some make them later), and the occasion of their separation

³ Comp. Moses and Aaron: Civil and Ecclesiastical Rites used by the Ancient Hebrews, eighth edition (London, 1672), book i, chap. xii, p. 50-59.

and consociation seems this. Many of the carnal Jews defiling themselves either by being too deeply plunged in worldly affairs, even to the neglect of their religion, or, which was worse, by sensual compliances with their idolatrous lords, thereby to secure their carnal interests, these **חסדים** or Essenes, to preserve themselves from these common pollutions, separated and retired themselves from the crowd of worldly affairs into an holy solitude, and private condition of life ; where they entered into a strict confederation or consociation to lead together a collegiate devout life.”⁴ He then gives an epitome of their doctrines and practices, and finally endeavours to shews that Pythagoras got his system from them. In doing this, Gale mixes up the Therapeutae with the Essenes, and follows largely the description of Godwyn.

1643-1724.—We then come to Dean Prideaux, who has a lengthy description of the Essenes in *The Old and New Testaments Connected*, part ii. book v., which first appeared in London, 1717. The chief value of Prideaux’s work on this subject consists in the fact, that he has given in English Philo and Josephus on the Essenes, as well as the short notice from Pliny. In his own remarks, which follow these extracts, he, in common with his predecessors, mixes up the Therapeutae with the Essenes, and tries to repel the Romanists who adopted the assertion of Eusebius (*Hist. Ecclesiast. lib. ii. c. 17*), that these Therapeutae or contemplative Essenes were Christian monks instituted by St. Mark. He also endeavours to expose the folly of the Deists, who infer, from the agreement between the Christian religion and the documents of the Essenes, that Christ and his followers were no other than a sect branched out from that of the Essenes. Among the accusations which the Dean brings against the Essenes for violating the law of God, is the charge that they “ absolutely condemned servitude which the holy Scriptures of the

⁴ *The Court of the Gentiles.* Pt. ii of “Philosophy,” Oxford, 1671, p. 147, &c.

New Testament (Philemon 9-21), as well as the Old, allow."⁵ Instead of blaming them for repudiating slavery, we believe that the civilized world in the present day will be unanimous in pronouncing it to have been one of the glorious features of Essenism, anticipating the spirit of Christianity and the philanthropy of the nineteenth century.

1653-1723.—Basnage gives a very lengthy account of the Essenes in his History of the Jews *lib. ii. chaps. xii. xiii.* Those who are acquainted with the writings of this learned Frenchman, know that he could not write on anything without bringing together a mass of useful information. He, however, mistook the character of the Essenes, as well as the value of the documents upon which he relies. Preferring Philo's account to that of Josephus, though the latter lived amongst the Essenes, Basnage confounds the brotherhood with the Therapeuta, and hence asserts that "they borrowed several superstitions from the Egyptians, among whom they retired." Through this, he is led to occupy by far the greater part of his description with the needless discussion of the question "Whether the Essenes from being Jews were converted to Christianity by St. Mark, and founded a monastic life."⁶

1692-1762.—Dr. Jennings' chapter on the Essenes is simply a commentary on Godwyn's account. Jennings disputes some of the imaginary parallels between Essenism and Pythagorism exhibited by Godwyn, and inclines to the opinion "that the Essenes began a little before the time of the Maccabees, when the faithful Jews were forced to fly from the cruel persecutions of their enemies into deserts and caves, and by living in those retreats, many of them being habituated to retirement, which thereby became most agreeable to them, they chose to continue it, even when they might have appeared upon the public

⁵ The Old and New Testaments Connected, seventeenth editions, vol iii. London, 1815, part ii, book v, p. 406—431.

⁶ The History of the Jews, from Jesus Christ to the present day. London, 1708, p. 125—137.

stage again, and accordingly formed themselves into recluses." As to the difficulty to account for "the absolute silence of the evangelical history concerning the Essenes," Jennings reiterates the remarks of Godwyn upon the subject.⁷

In 1821, appeared in Berlin, Bellermann's valuable little volume on the Essenes and Therapeutae.⁸ The author with characteristic German industry and perseverance, brought together in this monograph the ancient documents on the Essenes. His critical acumen, however, is not commensurate to his industry, and while his little volume will deservedly continue to be a useful manual for the student who wishes to acquaint himself with what Philo, Pliny, Josephus, Solinus, Porphyry, Epiphanius and Eusebius said upon this subject, it is to be questioned whether Bellermann's conclusions will be shared by many. He is of opinion that "the Essenes and Baithusians are the same both in name and doctrine," and that "the Essenes have four other names in history besides their proper name, viz. :—they are called, 1, *Therapeutae* by the Greek Alexandrians. 2. *Hiketeans* by Philo, in the superscription to the Treatise on contemplative life. 3. *Ossenes* or *Ossens*, by Epiphanius. And 4, *Baithusians* in the Talmud, and by several Rabbins. As this notion, which has been advanced by De Rossi three centuries and a half ago, has already been refuted, it would be needless to repeat the arguments here.

1825.—Neander, whose first instalment of his gigantic Church History appeared in 1825, now began to grapple with this mysterious brotherhood. In the introductory chapter of this history, in which a description is given of the religious condition of the world at the advent of Christ, he gives a very

7 Jewish Antiquities ; or a Course of Lectures on the two first books of Godwyn's Moses and Aaron, ninth edition. London, 1837, book i., chap. xii, p. 281—287.

8 Geschichtliche Nachrichten aus dem Alterthume über Essäer und Therapeuten. Berlin, 1821.

brief but very pregnant sketch of the Essenes. With that deep penetration, which was one of the chief characteristics of this sagacious critic, he repudiates the notion that the Essenes originated under foreign influences, and maintains that "it is a gross error to infer from the resemblance of certain religious phenomena the relationship of which is to be traced to a common inward cause, inherent in the nature of the human mind, that they have an external origin, having been copied from the other." Hence, he submits that Essenism arose out of the deeper religious meaning of the Old Testament, that it afterwards adopted some of the old Oriental, Parsee, and Chaldean notions, and that it had no Alexandrian elements. Neander moreover most justly cautions against the accounts of Philo and Josephus, saying that they clothed the opinions of the Essenes in a garb peculiarly Grecian, which we might rightly consider as not originally belonging to them.⁹

1829.—The difficulty which perplexed Christian writers, arising from the fact that the Essenes are not mentioned in the New Testament, did not affect Jewish writers, although it is true that this name is also not to be found in the ancient Jewish writings. For if it be granted that this appellation is a corruption of an Aramaic word, the Essenes must be looked for in the Talmud and Midrashim, which are chiefly written in Aramaic, under their original designation whatever that might be. The clue to it must, of course, be the identity of the features ascribed to them by Philo and Josephus and those ascribed in the ancient Jewish volumes to any order of Judaism. To this task Rappaport, the corypheus of Jewish critics, betook himself. Knowing that the Essenes were no distinct sect, in the strict sense of the word, but simply an order of Judaism, and that there never was a rupture between them and the rest of the Jewish community, Rappaport most

⁹ General History of the Christian Religion and Church, English Translation, Clark's Theological Library, vol. i, Edinburgh, 1851, p. 58—66.

justly does not expect that they would be spoken of under a fixed denominational name. He therefore rejects De Rossi's notion that the Baithusians, so frequently denounced in the Talmud and Midrashim, are the Essenes described by Philo and Josephus, and sought to identify them by their peculiar practices, expecting to find that they would be spoken of by different names. He soon found that what Philo and Josephus describe as peculiarities of the Essenes tallies with what the Mishna, the Talmud, and the Midrashim record of the *Chassidim* (חסדים), and that they are most probably the so-called *old believers* (וותיקים), who are also described in the Talmud as the *holy community in Jerusalem* (קהלא קדישא **דבירושלים**). He rightly recognised in them an intensified form of Pharisaism, and remarks that what is said in the Mishna about the moderation observed in eating and drinking, the great humility, endurance under sufferings, zeal for everything that is holy, community of goods, &c., refers to this holy community, or the Essenes. He also quotes the following remark from the Midrash Coheleth, on Eccles. ix, 9, about this holy community; “Rabi repeated from the traditions of the holy community (עדת קדושה) ‘acquire a trade in connection with the study of the Scriptures, &c.’—[Query] ‘Why are they called holy community?’ [Reply] ‘Because they divided the day into three divisions—devoting one-third to the study of the Scriptures, another to prayer, and the third to work. Some say that they devoted the whole of the winter to studying the Scriptures and the summer to work.’” He, too, was the first who pointed out that the prayer which Josephus tells us the Essenes offered up at the rising of the sun, is the national hymn of praise, which still constitutes a part of the Jewish daily service, and is as follows:—

He in mercy causes His light to shine upon the earth and upon the inhabitants thereof; and in His goodness unfailingly reneweth every day the work of creation. How numerous are Thy works, O Lord! Thou hast made them all in wisdom; the earth is full of Thy possessions.

O King, Thou only art the exalted one from everlasting, the praised and glorified and extolled since the days of yore ! Lord of the universe, in Thy great mercy have mercy upon us ! Lord our might, fortress of our strength, shield of our salvation, defend us ! O Lord, be Thou praised, Thou great in wisdom, who hast ordained and created the rays of the sun : the Infinitely Good has formed a glorious testimony for His name. He surrounded His majesty with luminaries The chiefs of His heavenly hosts are holy beings ; they glorify the Almighty ; they continually declare the glory of God and his holiness. Blessed be the Lord our God, for the excellency of the works of Thy hands, and for the shining luminaries which Thou hast. They shall glorify Thee for ever.

God, the Lord of all created things, is praised and blessed in the mouths of all the living. His power and goodness fill the universe ; wisdom and intelligence are round about Him. He exalts himself above the angels, and beams in glory upon his chariot-throne. Interceding goodness and rectitude are before His throne, loving-kindness and mercy before his majesty. Benign are the luminaries which our God has created. He has formed them in wisdom, intelligence, and understanding ; He has endowed them with power and strength to bear rule in the midst of the world. Filled with splendour and brightness, their glory illuminates all the world ; rejoicing in rising and joyous in setting they perform with awe the will of their Creator. They give praise and glory to His name, joy and song to the memory of His kingdom. He called the sun, and light rose ; He saw and shaped the form of the moon. Praise Him all ye heavenly hosts ; ascribe glory and majesty to Him ye seraphim, ophanim, and holy angels.

These, as Rappaport rightly remarks, are some of the remains of the ancient prayer used by the Essenes. It will be seen that these hymns of praise contain not only thanksgiving for the renewal of the light, to which Josephus refers, but they also refer to the mysterious cosmogony (*מעשה בראשית*) and theosophy (*מעשה מרכבה*), as well as to the angels which played such an important part among this brotherhood.¹⁰

1835.—The difficulty of reading Rabbinical Hebrew in which Rappaport's profound remarks are written, must have prevented Gfrörer from seeing what this erudite Jewish critic had written on the Essenes ; for, although the second edition of vol. i. part 11 of his *Critical History of Primitive Christianity*, containing an account of the Essenes, appeared in 1835, yet he positively states "that the Essenes and the Therapeutaee are the same sect and hold the same views" (p.299).

10 Rappaport, in the Hebrew Annual, entitled *Bikure Ha-Ittim*, vol. x, Vienna, 1829, p. 118 ff.

According to him, the development of Essenism is as follows. In the third century before Christ, the Jews in Alexandria formed societies according to the Pythagorean model, and thus originated the sect called the Therapeuta, from these Egyptian Therapeuta again Essenism developed itself in Palestine about 130 B.C. Hence Essenism is the channel through which the Alexandrian theosophy was first transplanted into Palestinian soil. The reason why the Essenes kept their doctrines secret is that the Palestinian priests were hostile to this foreign importation, and persecuted those who received this contraband. Accordingly, the relationship of Pythagorism, Therapeutism and Essenism, to use Gfrörer's own figure, is that of grandmother, mother and daughter. "So perfect is the agreement between the Therapeuta and the Essenes, that it even extends to their names. For the word 'Εσσαῖος, according to the most correct etymology, is derived from the Syro-Chaldaic verb ΝΩΝ which denotes *to cure, to nurse*, and hence is nothing but a literal translation of Θεραπευτὴς."¹¹

1843.—Similar in spirit is the elaborate article on the Essenes in *Ersch und Gruber's Cyclopædia*, written by Dähne, who maintains that "Essenism is the produce of the Jewish-Alexandrian philosophy, and that it is only when viewed from this stand-point that the deviations from the rest of their Jewish co-religionists, and their peculiar institutions, doctrines, and precepts appear in the clearest light." It is not surprising that holding such an opinion Dähne should feel perplexed to account for the existence of this thoroughly Jewish-Alexandrian order, as he makes the Essenes to be, in the very heart of Palestine. All that he can say upon this subject is, that they somehow got there in the middle of the second century before Christ. The affiliation of Essenism to the Jewish-

¹¹ Comp. *Kritische Geschichte des Urchristenthums*. 1 Theil Philo und die jüdisch-alexandrianische Theosophie, 11 Abtheilung. Stuttgart, 1835. p. 299-356.

Alexandrian philosophy brings it into most intimate relationship with Therapeutism, and necessarily devolves upon Dähne to define this family connection which he does in the following manner.¹² The difference between the Therapeutae and the Essenes, both of whom are followers of the Jewish-Alexandrian moral philosophy, is that the former devoted themselves entirely to a contemplative life, whilst the latter gave themselves more especially to a practical life. Hence though both rest upon the same foundation, the Therapeutae gave themselves up absolutely to the highest aim of man, as they marked it out, the contemplation of God; whilst the Essenes to some extent voluntarily lingered in the outer court of the Holy of Holies, placed themselves intentionally for the good of the brethren in more frequent contact with the world than the requirements of nature demanded, thereby generously, but certainly unphilosophically, temporarily retarding their own highest perfection and happiness." Like De Rossi, Bellermann, Gfrörer and others, Dähne derives the name from the Chaldee ΧΔΗ to heal, and says "accordingly the term Essenes denotes *spiritual physicians*, or men who strive in the highest sense to lead back the spirit to its natural (i.e. truly divine) character and activity."¹³

1846.—A new epoch began in the history of the Essenes with the investigation of Frankel on this subject, which

12 Diese Trennung nun aber unter den Anhängern der jüdisch-alexandrinischen Religionsphilosophie selbst in solche, welche sich ausschliesslich dem beschaulichen und in Andere, welche sich vorzugsweise dem praktischen Leben widmeten, ist es eben, welche sich in unserem fraglichen Doppelorden auch äusserlich repräsentirte, sodass, wenn schon beide ganz auf derselben philosophischen Unterlage ruhten, die Therapeuten sich möglichst ausschliesslich und unmittelbar dem höchsten von ihnen angestrebten menschlichen Lebensziele, der Auschanung Gottes selbst, hingaben, während die Essäer gewissermassen freiwillig in dem Vorhofe zum Allerheiligsten zögernd, sich absichtlich und zum Besten der Brüder häufiger in Berührung setzten mit dem Sinnlichen, als es die Naturnothwendigkeit foderte und so ihre eigene höchste Vollkommenheit und Seligkeit zwar grossmuthig, aber gewiss auch unphilosophisch genug augenblicklich noch verkümmerten.

13 Comp. Ersch und Gruber's Allgemeine Encyklopädie, section i. vol. xxxviii. p. 173-192.

appeared in his *Zeitschrift für die religiözen Interesse des Judenthums*, 1846. Taking up the idea of Rappaport, that the Essenes must be looked for in the body of the Jews and not as a separate sect, Frankel refers to the fact that, whilst the *Assideans* = *Chassidim* are referred to in 1 Macc. ii. 24; 2 Macc. xiv. 6, &c., the *Perushim* = *Pharisees* are never mentioned, to show that no such marked and denominational divisions existed at first in the community, and rightly remarks, that it “is only after a longer development that sects appear in their separation, and sharply defined features, when that which originally formed a united whole is now divided and parted into various branches. And even this partition and separation only shew themselves to the analysing mind, and especially when the analysis is conducted after a foreign fashion, as Josephus has done it, who reduced the Jewish sects into Greek schools, and made the Essenes correspond to the Pythagoreans. But in reality even these divisions flow one into another, and do not stand in opposition to one another, but are simply to be distinguished by their different shades of colour, and by the greater stringency or laxity with which the same rules are regarded, so that they do not form separate sects, but some individuals keep to these rules with greater anxiety, whilst others, though considering them as binding, do not regard them as having such a wide application. Now in early times there were only *Essenes* = *Chassidim* (חסדים), the name of *Perush* = *Pharisee* (פרוש) was not as yet known; it was only afterwards when in succeeding periods some became more rigid in their manner of life and views of religion, that the name *Pharisees* (פרושים) appears to denote the less strict Jews, whilst the others were in a special degree denominated by the old, respectable appellation *Chassidim* = *Essenes* (חסדים).” This, Frankel corroborates by showing most clearly that many of the vital principles which Josephus describes as peculiar to Essenism, are at the very basis of

Pharisaism, and that the Essenes are frequently mentioned in the Mishna, Talmud, and Midrashim by the names **חסדים** **חברים** *the original Assideans = Chassidim, the associates,* **ותיקין** *those who have enfeebled their bodies through much study;* **דבירושלים** *the retired ones;* **צנוין** *the holy congregation in Jerusalem;* **טובי** **קהלא קדישא** *the hemerobaptists.* Frankel concluded his essay with the promise to return to this subject on some future occasion.¹⁴

1847.—Within twelve months of the publication of Frankel's elaborate Essay, an article appeared in the American Quarterly entitled *The Biblical Repository*. As there was not sufficient time for this German production to become known in the New World, Mr. Hall, the writer of the article, could not avail himself of it, and was therefore obliged to derive his information from the writings of Dr. Neander. But though Mr. Hall has thrown no light on the Essenes, yet his reflections upon their moral character and their connection with Christianity are so just, sensible and candid, that we subjoin them to show that good Christians may honestly acknowledge the good in Essenism without detracting from Christianity.

“ Let us give the Essene credit for all that he was as a worshipper of the true God, and as a man striving after moral purity in a corrupt age. The Gospel that breathed new life into the higher nature of man, can afford to allow all his virtues. We know that the Spirit of Christ opens the eye to the excellencies of others. Truth rejoices in truth, and as all truth is from the same souree, the lustre of one development can never be increased by hiding the glory of another. We would not enhance the necessity of our Lord's appearance by depreciating the moral condition of mankind at that period. Those ascetic Jews deserve well of mankind for the light they gave out in a dark age. We admire the humanity and justice of their principles; their disapproval of war and slavery in the midst of a world lying in wickedness, and the noble example of industry, frugality and moderation in the things of this life they set before all. We honour their honest endeavours to combine the *vita contemplativa* and the *vita activa*,—to escape the bondage of the senses, to maintain the supremacy of the spirit, and to unite themselves with the Highest. But in all these respects, they are only the true children of monotheism, the legitimate offspring of the Jewish theocracy. They could have sprung up nowhere else. In the phenomenon of the Essenes let us

14 Comp. Frankel, *Zeitschrift für die religiösen Interessen des Judenthums*, vol. iii Berlin, 1846, p. 441-461.

therefore adore the provident wisdom of Jehovah, and recognize the secret working of his love in carrying forward the great, eternal economy of salvation. They exerted an influence on their age which helped to pave the way for the Christ. Conscience spoke, and was spoken to, through them; and the dying sense of virtue was kept alive. Thus were they stars which emitted an humble though useful light before, but grew pale and became invisible after, the coming of the Sun of Righteousness."¹⁵

1852.—Though Ewald published the second edition of the fourth volume of his Jewish History in 1852, when Frankel's Essay had been six years before the literary world, yet he manifests total ignorance of it in his account of the Essenes, contained in this volume. Still, this profound and merciless critic, without having access to the Jewish information gathered from the Talmud and Midrashim, saw that Essenism was no Greek plant transplanted into Palestine, but like Pharisaism grew out of the Chassidim. He remarks that "people, who left the great community in order to lead a specially holy life, with the permission and under the direction of the law, were to be found in Israel from the remotest times, yet in its first form there were only the Nazarites, of whom each one lived for himself; and in the second, the Rechabites combined themselves already into a larger union; but now the whole conscience of the people itself, as it were, departed into solitude with numerous Essenes. For it cannot be denied that they, proceeding from the Chassidim, represent the direct and legitimate development of Judaism in the form which became the ruling one since Ezra." "Their new features and endeavours merely consisted in their intensely earnest and rigorous application of the demands of the law, as understood and interpreted since Ezra. Finding that the rigorous and logical application of these laws was impossible in the great community, especially in that community as regulated by the Pharisees, they preferred to congregate and

¹⁵ Comp. The Biblical Repository and Classical Review. New York, 1847, p. 162-173.

live in solitude.”¹⁶ Very unfortunate is Ewald’s derivation of Essene from the Rabbinic שִׁבְעָה *servant* (of God), and the assertion that this name was given to them because it was their only desire to be θεοπαπενταὶ θεοῦ.

1853.—Nearly seven years had now elapsed since Frankel published his masterly Essay on the Essenes, and promised to return to this subject at some future time. True to his promise, he now gave another elaborate treatise, in which he substantiated, by numerous quotations from the Talmud, his former conclusions, that the Essenes are the offspring of Judaism, that they are nothing but stationary, or more correctly speaking consequential Chassidim, that they were therefore not so far distant from the Pharisees as to be regarded as a separate sect, but, on the contrary, that they formed a branch of Pharisaism.¹⁷

1856.—So convincing was Frankel’s Treatise, that Graetz, who published the third volume of his masterly History of the Jews in 1856, in which he gives an elaborate account of this brotherhood, remarks:¹⁸ “I completely accept these results about this sect being based upon critical investigation, and shall only add a few supplementary points by way of illustration.”¹⁹ The additions consist of a very able analysis of Philo’s reputed Treatise entitled *De Vita Contemplativa*, showing that it is spurious, and of an attempt to show that the Essenes were *perpetual Nazarites* (נָזִיר עֲולָם). His remarks are as follow—“There were great masses of Nazarites in the

16 Geschichte des Volkes Israel, Vierter Band. Göttingen, 1852, p. 419–428.

17 Comp. Monatschrift für Geschichte und Wissenschaft des Judenthums, Zweiter Jahrgang. Leipzig, 1853, p. 30–40; 61–73.

18 Ich nehme diese auf kritischer Forschung, beruhenden Resultate über diese Secte vollständig an und werde nur noch einige Punkte nachträglich beleuchten.

19 Die Eigenthümlichkeiten der Essäer lassen sich nicht genügend aus dem Wesen der im Talmud vorkommenden חֲסִידִים הָרָשִׁים und der in der Makkabäerzeit auftretenden „Assidäer“ erklären; man muss auch auf das nasiräische Wesen Rücksicht nehmen. Nasiräer gab es in der nachexilischen Zeit eine grosse Menge (*Tosijta Nasir c. iv. Babli Berachot 48 a. 1 Makkab. ii. 49. Jos. Alterth. xviii, 6, 1*). Aber sie trugen zugleich einen andern Charakter, als

post-exile period (*Tosifta Nasir*, c. iv.; *Babbi Berachoth*, 48 a; 1 *Macc.* ii. 49; *Joseph. Antiq.* xviii. vi.), but they were of a different character to those of the Biblical period; they were *Nazarites for the whole life* (*Nasir* 4 a.) The Mishna presupposed their existence; the magical in Nazaritism, which was connected with the growing of the hair in the Nazarites of the Bible, gradually recedes into the back ground or loses its significance altogether; whereas the Levitical, the guarding against defilement, appears more and more in the foreground among the life long Nazarites. The Essenes then were such Nazarites as represented in private life the highest priestly consecration. The connection between the Nazarites and Essenes has already been indicated in obscure passages in the Talmud, that one consecrated himself to be a perpetual Nazarite if he simply wished to be a Nazarite in order that he

die der biblischen Zeit: sie waren Nasiräer fürs ganze Leben (*Nasir* 4 a). Die Mischna setzt das Vorhandensein solcher ohne Weiteres voraus, und das Magische an dem Nasiräerthum, das sich bei den biblischen Nasiräern an den Haarwuchs knüpfte, tritt immer mehr zurück, oder hat vielmehr gar keine Bedeutung mehr. **נָזֵר טָהָרָה שְׁרוֹם מִקְלָבָשׁ** (das). Hingegen tritt bei den lebenslänglichen Nasiräern das Levitische, die Hut vor Veranreinigung, immer mehr in den Vordergrund (das.) Die Essäer werden also solche Nasiräer gewesen sein, welche in ihrem Privatleben die höchste priesterliche Weihe darstellen wollten. Den Zusammenhang zwischen Nasiräern und Essäern deutet schon eine dunkle talmudische Stelle an, dass Jemand sich dadurch schon dem vollständigen Nasiräer weilt, wenn er auch nur insofern Nasiräer sein will, um die Geheimnisse entzehrender Familienverhältnisse bewahren zu können: **הַרְיִי נָזֵר אֶת מִשְׁבָּחָה הַרְיִי נָזֵר וְלֹא יָלֵא יְלָה כְּשַׁבָּחָה אֶל אָגָּלָה** (*Tosifta Nasir* c. 1 b *Kiduschim* 71 a). Die Erklärung dieser Stelle durch den Essenismus hat schon Edeles (**מהרשות**) in seinem Agadacommentar z. St. geahnt. Diesen Zusammenhang zwischen Nasiräerthum und Essenismus haben Epiphanius und die arabischen Schriftsteller Makrasi und Abulfarag' geahnt; wenn auch Epiphanius die *Naṣarātōi* von den *Oστρινοί* unterscheidet, so sind die Eigenheiten, die er von den Erstern berichtet, doch ganz essäisch. Ebenso hat Makrasi die Essäer in drei Secten zerspalten, in die Täufer (**מִנְתְּחָרִים=יְמִרְפּוֹבָתְּפִרְשָׁתָאִים**), die Essäer (**גְּנָזְרָה**) und in die Nasiräer (**מְהֻחָבָן**) (in *de Sacra Chrestomathie Arabe* Ausgabe von 1806, arabischer Theil 172 und *tome* ii, 218). Das arabische Makkabäerbuch bezeichnet die Essäer durch Chassidäer (c. xxv); in Josippon fehlen an der Stelle, wo er von den drei Secten spricht, gerade die Essäer (iv, 6, Breithaupt). Die Identität von Nasiräern, Essäern und Assidäern wird also von vielen Seiten bestätigt. Auch aus Josephus' Angabe, die Essäer hätten eigne Bücher gehabt (jüd. Kr. ii, 8, 7), lässt sich ihre Identität mit den Assidäern erweisen. Im Talmud (Jeruschalmi Barachot, Ende) wird aus einem Buche der Chassidäer der Satz mitgetheilt: „*וְלֹא תְּלַזֵּן עַל-בָּנָךְ כִּי-בְּבָנָךְ תְּלַזֵּן*“: „Verlässt du sie einen Tag, so verlässt sie dich zwei Tage“:

might be able to preserve the secrets of disgraceful family circumstances. (*Tosifta Nasir*, b. i. 6; *Kidushim* 71 a.)²⁰

1857.—The learned historian Jost, who published the first volume of his History of Judaism in 1857, was also perfectly convinced by the results of Frankel's researches, and made them the basis of his excellent description of the Essenes, in which he maintains that they grew out of Pharisaism or from the ancient *Chassidim*. "The Essenes," he submits, "are exactly the same that the other Rabbis wished to be who endeavoured to practise the Levitical law of purity, as leading to higher consecration. They have neither another creed nor another law, but simply institutions peculiar to this brotherhood, and endeavour to reach the highest consecration by their manner of life, in defining the different stages, according to preliminary exercises and certain years of preparation. Their views and tenets are therefore also to be found in the utterances of the learned and the Rabbis who did not enter their order, so that they did not look upon the Essenes as opponents or apostates, but, on the contrary, as holding the same opinions with increased claims and some fewer enjoyments, whom many out of their own midst joined, and who were called *Chassidim* or *Zenuim*."²¹

1857.—The comparatively few and unessential deviations from Judaism to be found in Essenism were, however, more than Herzfeld could tolerate, without characterising the innovators as heretics and smugglers of contraband opinions. Dissatisfied with the modern researches of Frankel and Graetz on this subject, this learned historian, and chief Rabbi of Brunswick, returned to the old notion of De Rossi, that the Essenes of Josephus and Philo are identical with the Baithusians mentioned in the Talmud. Still he thinks that De Rossi's

20 *Geschichte der Juden*, vol. iv. Leipzig, 1856, p. 96-106; 518-528.

21 *Geschichte des Judenthums und seiner Secten*, vol. 1. Leipzig, 1857, p. 207-215.

opinion "must be better proved than he had done it," and therefore remarks—"first of all, seeing that the prefixed **בֵּית** denotes school or sect in the appellations Beth-Shammai, Beth-Hillel; that **בֵּית הַכּוֹתִים** in Tosista Helem ii. b, and **בֵּית כּוֹתָאֵי** in Chullin 6 a, denotes *the sect* or *the land* of Cuttim; and then that **בֵּית סִין** stands twice Tosista Succa, cap. iii., and Tosista Menachoth cap. x. for Baithusians, can it mean anything else than *house* or *sect of Essenes*? When **אַסִּי physician** became the name of a sect, an Essene could not so well be called **אַסִּי** without ambiguity; he was therefore described as one of **בֵּית אַסִּי**."²² Thus much for the origin of the name, and now let us hear Dr. Herzfeld's theory about the brotherhood itself. It is simply this²³—"A Jew, who became acquainted with the allegorical exegesis prevalent among the Alexandrian Jews, and with its mother the Greek wisdom, but who, like Pythagoras, Plato and Herodotus, had also found

22 Die Essäer waren die Baitusim, wie schon R. Asarja de' Rossi vermutet hat; es muss dies nur besser begründet werden, als von ihm geschehen ist. Ich bemerke zu dem Ende erstens, dass wie das vorgesetzte **בֵּית** auch in den Benennungen Bet-Schammaj, Bet-Hillel Schule oder Fraction bedeutet, so *Tosista Kelim* ii, 6, **בֵּית הַכּוֹתִים**, *Chulin* 6, a für die Sekte oder das Land der Cutim vorkommt; sodann dass *Tosista Succa*, K. iii zweimal und *Tosista Menachot* K. x. für Baitusim **בֵּית סִין** stehet: kann dies wohl etwas Anderes als Haus, Sekte der Essener bedeuten? Als **אַסִּי** (Arzt) Sektenname wurde, konnte man den Essäer nicht gut mehr schlechthin **אַסִּי** nennen, ohne undeutlich zu werden, man umschrieb ihn daher wohl als Einen vom **בֵּית אַסִּי**, bildete danach auch mit Zugrundelegung der Form Essener, das nachgewiesene **בֵּית סִין**, und zog dann Jenes zusammen, um den einzelnen Essäer zu bezeichnen, gab aber dieser Form den u-Laut, entweder nachdem man das syrische Wort **אַסִּי** zuweilen nach syrischer Weise *ásseh*, also dunkel ausgesprochen hatte, woher die Ansprache Ossener bei Epiphanius herriühren mag, oder was mir noch wahrscheinlicher ist, indem man dem Worte *Peruschim* conform Zedukim und Baitusim bildete.

23 Nach allem diesen scheint es, dass ein Jude, welcher mit der unter den alexandrinischen Juden aufblühenden allegorischen Exegese und mit deren Erzeugerin, der griechischen Weisheit, bekannt geworden war, daneben aber auch Gelegenheit gefunden hatte, von ägyptischen Priestern Manches zu lernen, wie Pythagoras selbst, Platon und Herodot, den Plan gefasst und ausgeführt habe, eklektisch hieraus und aus dem Judenthum ein speculatives und asketisches System sowie nach demselben aus jüdischen Asketen eine Sekte zu bilden. Dass es an Solchen nicht gefehlt habe, verbürgt das Vorkommen von Nasiräern, z. B. nach *Tosista Nasir* K. iv unter Schimon dem Gerechten, ferner I Mack. iii, 49, und von ihrer 300 auf einmal unter Schimon ben Schatach nach *Nasir jer.* v. 3. Dass er aber nicht mit jüdischen Asketen in Aegypten diesem Versuch machte, geschah vielleicht, weil es damals dort noch an solchen Asketen fehete, oder weil er selbst aus Judäa gebürtig sein möchte.

an opportunity to learn some things from Egyptian priests, conceived and carried out the plan, eclectically to form from it and from Judaism a speculative and ascetic system, as well as to organise, according to its model, a sect from the Jewish ascetics."²⁴ This Alexandrianized Palestinian Jew founded the order of the Essenes in Palestine about 230 B.C.

1857.—Another effort was made in this year to explain the origin of this mysterious brotherhood. Professor Hilgenfeld of Jena, who maintains their genuine Jewish origin, starts the notion that the Essenes belonged to the Apocalyptic school, and that they must be regarded as the successors of the ancient prophets, and as constituting the prophetic school. It is only when we view them from this stand point that their precepts and practices can be understood, and that the high antiquity ascribed to them by Josephus (Antiq. xviii. 1, 2) and Pliny (Hist. Nat. v. 17), can be comprehended. This he moreover assures us gives the clue to the explanation of their name. The Hebrew prophets were also called סִירִים *seers*, which, being in the Aramaic pronunciation סִירִים, easily gave rise through Greek change of vowels to the name *'Εσσαῖον*, *'Εσσηνοί*. Hilgenfeld manifests an almost inexcusable ignorance of the labours of Frankel and Graetz on the Essenes.²⁵

1860.—A necessarily brief but interesting article on the Essenes, written by the able Mr. Westcott, appeared in Smith's Dictionary of the Bible. The writer wisely availed himself of the labours of Frankel and Jost, and properly traced the origin of the brotherhood to the Chassidim. His fear, however, lest any shining virtues in the Essenes might be thought by some to pale some of the brightness of the Sun of Righteousness, prevented him from appreciating the true

²⁴ Geschichte des Volkes Israel von Vollendung des Zweiten Tempels bis zur Einsetzung des Mackabäers Schimon zum hohen Priester und Fürsten, Zweiter Band. Nordhausen, 1857, p. 368-377; 387-409.

²⁵ Die jüdische Apokalyptik in ihrer geschichtlichen Entwicklung. Jena, 1857, p. 245-278.

character of this order, as well as from seeing that they paved the way to Christianity.

1863.—Graetz again, in the second edition of the third volume of his History of the Jews, in which he has an additional chapter on the Rise and Progress of Christianity, goes to the other extreme, and maintains that Jesus simply appropriated to himself the essential features of Essenism,¹⁶ and that primitive Christianity was nothing but an offshoot from Essenism.

1862.—Of the article on the Essenes in Dr. Alexander's valuable edition of Kitto's Cyclopædia of Biblical Literature, being written by me, I can do no more than say that it embodies the substance of this Essay.

1863.—The description of the Essenes in the new edition of Dean Milman's History of the Jews, gives a very imperfect idea both of the development and morality of this brotherhood.

Before the meeting separated, the President announced that he had a communication to make, which was that he was under the necessity of resigning the chair of the society which he had held for the past year, as he had made arrangements to leave this country to reside at Heidelberg. He thanked the society for the honour they had done him, and for their individual kindness, and expressed his regret at parting from his friends, assuring them, however, that he should still continue his interest and his contributions to the society.

Dr. COMMINS proposed a vote of thanks to the President, and expressed the great regret of the society at his coming departure, and their best wishes for his future prospects.

Dr. EDWARDS seconded the motion, which was carried by acclamation.

Dr. Ihne having suitably acknowledged the resolution, quitted the chair, and the society adjourned until October next.

¹⁶ Geschichte der Juden, Dritter Band Zweite Auflage. Leipzig, 1863, p. 216-252.

ADDITIONS TO THE LIBRARY,

RECEIVED FROM MAY, 1862, TO MAY, 1863.

1862.	Title.	Donor.
OCTOBER 6th.		
Proceedings of the Society of Antiquaries, vol. 1, Nos. 4, 5, 6, 7	<i>The Society.</i>
Proceedings of Geologists' Association, Nos. 1—8		<i>The Association.</i>
Transactions of the Tyneside Naturalists' Field Club, vol. 5, part 3	<i>The Club.</i>
Proceedings of the Literary and Philosophical Society of Manchester, vol. 2	<i>The Society.</i>
Memoirs of the Literary and Philosophical Society of Manchester, 3rd series, vol. 1	<i>The Society.</i>
Journal of the Statistical Society, June and Sep- tember, 1862	<i>The Society.</i>
Journal of the Royal Dublin Society, Nos. 24 and 25	<i>The Society.</i>
Proceedings of the Royal Society, Nos. 49, 50, 51	<i>The Society.</i>
Silliman's American Journal, May and July, 1862	<i>B. Silliman.</i>
Journal of the Franklin Institute, Nos. 436—441	<i>The Institute.</i>
Quarterly Journal of the Geological Society, Nos. 69 and 70	<i>The Society.</i>
Journal of the Linnaean Society, No. 23	<i>The Society.</i>
Quarterly Reports of the Meteorological Society of Scotland, December, 1861, and March, 1862	<i>The Society.</i>
Canadian Journal of Industry, Nos. 38—40	<i>Canadian Institute.</i>
Report of Plymouth Institution, 1861—62	<i>The Institution.</i>
OCTOBER 20th.		
Greenwich Observations, 1860	<i>The Admiralty.</i>
Errata in Hansen's Lunar Tables	<i>The Admiralty.</i>
Journal of the Royal Geographical Society, vol. 31	<i>The Society.</i>

Title.	Donor.
Journal of the Royal Asiatic Society, vol. 19, pt. 4 <i>The Society.</i>	
Monthly Notices of Royal Astronomical Society,	
Nos. 5, 6, 7, 8	<i>The Society.</i>
Proceedings of the Royal Geographical Society,	
vol. 6, Nos. 2—4	<i>The Society.</i>
Annual Report of the Royal Cornwall Polytechnic Society, 1861	<i>The Society.</i>
Radcliffe Catalogue of Stars for 1845 .	<i>Radcliffe Trustees.</i>
Journal of the Society of Arts, May to October .	<i>The Society.</i>
Schrift der Königlichen Gesellschaft zu Königsberg, 1861, part 1	<i>The Society.</i>
Verhandlungen des Vereins für Naturkunde zu Presburg, 1859-61	<i>The Verein.</i>
Neunter Bericht der Oberhessischen Gesellschaft, 1861	<i>The Society.</i>
Mittheilungen der K. K. Geographischen Gesells- chaft, Wien, 9 parts (Hefts)	<i>The Society.</i>
Memoires de la Societé imp. d'Emulation d'Abbe- ville, 1857, 1860, vol. 1	<i>The Society.</i>

NOVEMBER 3rd.

The United States' Survey of the Southern Hemisphere, vols. 1, 2, 3, 6

The Superintendent of the National Observatory at Washington.

Patent Reports (Agriculture, Arts, and Manufactures), from 1849 to 1858, 15 vols.

*The United States' Patent-office,
Washington.*

Catalogue of the Astor Library, New-York, 4 vols. *The Library.*
 Journal of the Royal Asiatic Society, vol. 20, pt. 1 *The Society.*
 Journal of the Society of Arts, October 24 and 31 *The Society.*
 Journal of the Linnean Society, No. 24 . . . *The Society.*
 Quarterly Report of the Meteorological Society of

Scotland The Society.
On the Theory of the Polyedra, by the Rev.
T. P. Kirkman, M.A., F.R.S., hon. member The Author.

Title.	Donor.
NOVEMBER 17th.	
Transactions of the Royal Irish Academy, vol. 23, part 2, and vol. 24, part 2	<i>The Academy.</i>
Proceedings of the same, vol. 7, parts 1—8	<i>The Academy.</i>
Journal of the Franklin Institute, No. 442	<i>The Institute.</i>
American Journal of Arts and Sciences, No. 161	<i>The Editor.</i>
Canadian Journal of Industry, No. 41	<i>Canadian Institute.</i>
Medico-Chirurgical Transactions, vol. 45	<i>The Society.</i>
Journal of the Society of Arts, Nov. 1st to 15th	<i>The Society.</i>
DECEMBER 1st.	
Results of Meteorological Observations made under the direction of the Smithsonian Institution, 1854-9, 1 vol. 4to.	<i>Smithsonian Institution.</i>
Smithsonian Miscellaneous Contributions, 4 vols.	<i>Smithsonian Institution.</i>
Smithsonian Report, 1860.	<i>Smithsonian Institution.</i>
Proceedings of the Boston Society of Natural History	<i>The Society.</i>
Quarterly Journal of the Geological Society, No. 72	<i>The Society.</i>
Proceedings of the Royal Society of Edinburgh, 1861-62	<i>The Society.</i>
Proceedings of the Royal Geographical Society, vol. 6, No. 5	<i>The Society.</i>
Journal of the Geological Society of Dublin, vol. 9, part 2	<i>The Society.</i>
Journal of the Society of Arts, Nov. 21 and 29	<i>The Society.</i>
Monthly Notices of the Royal Astronomical Society, vol. 22, No. 9	<i>The Society.</i>
DECEMBER 15th.	
Transactions of the Botanical Society of Edinburgh, vol. 7, part 2	<i>The Society.</i>
Journal of the Franklin Institute, No. 443	<i>The Institute.</i>
Monthly Notices of the Royal Astronomical Society, vol. 23, part 1	<i>The Society.</i>
Journal of the Society of Arts, Dec. 5th and 12th	<i>The Society.</i>

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On some Inscriptions from Cyprus, by Commodore
Leycester, R.N., F.R.G.S. *The Author.*

1863.

JANUARY 12th.

American Journal of Arts and Sciences for Nov. *B. Silliman.*
Proceedings of the Royal Society, No. 52 . . . *The Society.*
Transactions of the Royal Scottish Society of Arts,
vol. 56, part 2 *The Society.*
Canadian Journal of Industry, No. 42, N.S. *Canadian Institute.*
Journal of the Franklin Institute, No. 444 *The Institute.*
Proceedings of the American Philosophical Society *The Society.*
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Monthly Notices of the Royal Astronomical
Society, vol. 23, No. 2 *The Society.*
Proceedings of the London Royal Institution,
part 2, 1861-2 *The Institution.*
Proceedings of the Liverpool Philomathic Society,
1861-62 *The Society.*
Le Tueur de Lions, par Jules Gérard *The Author.*

JANUARY 26th.

Journal of the Society of Arts, Jan. 10 and 24 . *The Society.*
Journal of the Meteorological Society of Scot-
land *The Society.*
The North Atlantic Seabed, by Dr. Wallich
*The Lords Commissioners
of the Admiralty.*

FEBRUARY 9th.

Journal of the Society of Arts, 2 numbers . . . *The Society.*
Journal of the Franklin Institute, No. 445 . . . *The Institute.*
Tenth Report of the Trustees of the Free Public
Library of Boston *The Library.*
Journal of the Royal Dublin Society, July—
January, 1861 *The Society.*
Proceedings of the Royal Society, No. 53 . . . *The Society.*
Proceedings of the Royal Geographical Society,
vol. 7, No. 1 *The Society.*

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Mittheilungen der K. K. Geographischen Gesellschaft von Wien, 5te Jahrgang, 1861 . . . *The Society.*

FEBRUARY, 23rd.

Journal of the Society of Arts, 2 numbers . . . *The Society.*
 Monthly Notices of the Royal Astronomical Society, vol. 23, No. 3 *The Society.*
 Proceedings of the British Meteorological Society, vol 1, Nos. 1—4 *The Society.*
 Eleventh Report of the Council of the British Meteorological Society *The Society.*
 Report of the Meteorology of England for 1861, vol. 1, Nos. 1—4 *The Society.*

MARCH 9th.

Journal of the Society of Arts, March 7 *The Society.*
 Quarterly Journal of the Geological Society, vol. 19, No. 73 *The Society.*
 Journal of the Statistical Society of London, for 1863 *The Society.*
 Journal of the Linnaean Society, No. 25 *The Society.*
 Transactions of the Tyneside Field Naturalists' Club, vol. 5, part 4 *The Club.*

MARCH 23rd.

Journal of the Society of Arts, March 13 and 20 . *The Society.*
 Proceedings of the Royal Society, No. 54 . . . *The Society.*
 Canadian Journal of Industry *Canadian Institute.*
 Monthly Notices of the Astronomical Society, vol. 13, No 4 *The Society.*
 Journal of the Franklin Institute of Philadelphia, No. 416 *The Institute.*
 On the Application of the Theory of the Polyhedra, to the Enumeration and Registration of Results, by the Rev. T. P. Kirkman, hon. member . . *The Author.*

APRIL 20th.

American Journal of Science and Arts, No. 103 . *B. Silliman.*
 Proceedings of the American Philosophical Society *The Society.*

Title.	Donor.
Monthly Notes of the Royal Astronomical Society, vol. 23, No. 5	<i>The Society.</i>
Proceedings of the Royal Geographical Society of London, vol. 7, No. 2	<i>The Society.</i>
Journal of Society of Arts, five weeks	<i>The Society.</i>
Journal of Franklin Institute, No. 447	<i>The Institute.</i>
Proceedings of the Berwickshire Naturalists' Club, 1862	<i>The Club.</i>
Proceedings of the British Meteorological Society, vol. 1, No. 5	<i>The Society.</i>
MAY 4th.	
Correspondenzenblatt des Vereins für Naturkunde zu Presburg, 1 Jahrgang, 1862	<i>The Society.</i>
Memoires de la Société Imperiale des Sciences Naturelles de Cherbourg, Tom. 7	<i>The Society.</i>
Proceedings of the Academy of Natural Sciences Philadelphia, Nos. 7—12, 1862	<i>The Academy.</i>
Report of the British Association, Manchester, 1861	<i>Dr. Inman.</i>
Proceedings of the British Meteorological Society, vol 1, No 6	<i>The Society.</i>
American Journal of Science and Arts, No. 104	<i>B. Silliman.</i>
Canadian Journal of Industry	<i>Canadian Institute.</i>
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PROCEEDINGS

OF THE

LITERARY AND PHILOSOPHICAL SOCIETY

OF

LIVERPOOL,

DURING THE

FIFTY-THIRD SESSION, 1863-64.

No. XVIII.



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ON THE SOCIETY'S ROLL AT THE CLOSE OF THE 53RD SESSION.

Those marked + are Original Members of the Society.

Life Members are marked with an asterisk.

Jan. 26, 1863 Abbott, Joseph, B.A., *Liverpool College*, and 73,
Spence-street, Everton.

Oct. 11, 1833 Aikin, James, 2, *Drury-lane*, and 4, *Gambier-terracee.*

Dec. 10, 1860 Alexander, James, 8, *York buildings, Dale-street*, and
Southport.

Jan. 8, 1861 Anderson, David, 5, *Castle street*, and 7, *Church-street,*
Egremont.

Dec. 11, 1854 Andrew, John, *Fenwick chambers*, and *Sandown-park,*
Wavertree.

Mar. 7, 1864 Archer, F., jun., B.A., Trin. Coll., Cantab., 10, *Rodney-*
street.

*Nov. 28, 1853 Arher, T. C., F.R.S.E., F.R.S.S.A., Director of the
Industrial Museum of Scotland, *Edinburgh.*

Dec. 14, 1863 Ashe, Theophilus Fielding, 45, *South Castle-street*, and 4, *Dingle-lane*.

Feb. 22, 1855 Avison, Thomas, F.S.A., 18, *Cook-street*, and *Fulwood-park*, *Aigburth*.

Dec. 10, 1860 Baar, Rev. Hermann, Ph. D., 98, *Bedford-street South*.

Jan. 11, 1864 Bagshaw, John, 87, *Church-street*, and 36, *Bedford-street North*.

May, 1, 1854 Bahr, G. W., 4, *Cable-st.* and 2, *South-hill Grove*, *Aigburth*.

May 4, 1863 Bailey, Fras. J., M.R.C.S., 48, *Oxford-street*.

Dec. 15, 1862 Balman, Thomas, M.D., 6, *Bedford-street South*.

Oct. 29, 1860 Banister, Rev. W., B.A., *St. James's Mount*.

Jan. 13, 1862 Baruchson, Arnold, 35, *Dale-street*, and *Blundell sands*, *Great Crosby*.

Nov. 3, 1862 Behrend, Saml. H., M.A., 24, *Clarendon-rooms*, and 15, *Canning-street*.

Mar. 9, 1857 Bell, Christopher, *Moor-st.*, & 69, *Bridge-st.*, *Birkenhead*.

Feb. 6, 1854 Bennett, William, *St. George's-place*, *Lime-street*, and 109, *Shaw-street*.

Nov. 2, 1863 Billson, Alfred, 46, *Castle-street*, and 14, *Sandon street*.

Oct. 31, 1859 Birch, Jas., 13, *The Temple*, *Dale-st.*, & 7, *Upper Baker-st.*

Jan. 25, 1864 Birchall, James, *Industrial Schools*, *Kirkdale*.

Feb. 4, 1856 Bird, W. V., M.D., *Aberd.*, *Church-street*, *Egremont*.

April 15, 1861 Blake, James, 63, *Kitchen-street*, and 45, *Canning-street*.

Oct. 31, 1859 Bloxam, Frederick William, *Alliance Bank*, *Brown's-buildings*, and 157, *Islington*.

Jan. 12, 1863 Bolton, Ogden, *Prince's-buildings*, *Harrington-street*, and 10, *Great George-square*.

*Mar. 6, 1835 Boult, Swinton, 1, *Dale-street*, and 3, *Bedford-street South*.

Oct. 21, 1844 Bright, Samuel, 1, *North John-street*, and *Sandheys, Mill-lane*, *West Derby*.

*Jan. 8, 1855 Brockholes, James Fitzherbert, *Puddington Old Hall*, *near Neston*.

Dec. 2, 1861 Browne, G. Mansfield, 15, *Fenwick-street*, and 15, *South-hill-road*, *Toxteth-park*.

April 21, 1862 Bulley, Samuel, *Peter's place*, *Rumford-street*, and *East Lodge*, *Prince's-park*.

April 18, 1864 Burne, Joseph, *Royal Insurance Office*, 1, *North John-street*, and *Higher Tranmere*.

Mar. 9 1863 Buxton, David, F.R.S.L., Principal of the School for the Deaf and Dumb, 52, *Oxford-street*.

*May 1, 1848 Byerley, Isaac, F.L.S., F.R.C.S., *Victoria-road, Seacombe, TREASURER.*

Feb. 23, 1863 Callon, W. J., M.D., 125, *Islington.*

Nov. 3, 1862 Cameron, John, M.D., M.R.C.P., Physician to the Southern Hospital, and Lecturer on Medicine at Royal Inf. Sch. of Med., 17, *Rodney-street.*

April 7, 1862 Campbell, John, *Liverpool and London-chambers, and Oak House, Aigburth-hall road.*

April 7, 1862 Cawkitt, James M., *Underwriters' Room, Exchange, and 23, Queen's-road, Everton.*

Dec. 2, 1861 Chadburn, William, 71, *Lord street.*

Dec. 1, 1851 Clare, John Leigh, 11, *Exchange-buildings, and The Old Hall, Aigburth-road.*

Oct. 31, 1859 Clark, Charles, 17, *North John-st., and Linden Cottage, Rock Ferry.*

Jan. 26, 1857 Clay, William, 97, *Sefton-street, and 4, Parkhill-road.*

May 31, 1858 Collingwood, Cuthbert M.A., M.B., Oxon, M.R.C.P., F.L.S., Lect. on Botany, Royal Infirmary Sch. of Med; Phys. to the Northern Hospital, 15, *Oxford-street. Hon. SECRETARY.*

Jan. 26, 1863 Commins, Andrew, LL.D. Dub., *Clarendon-chambers, 1, South John-street,*

Jan. 22, 1850 Cox, Henry, 19, *Brunswick-street, and Poplar-rd., Oxton.*

Jan. 12, 1863 Cros, Jean Baptiste, 69, *Bold-street, and 8, Oxford-street.*

Oct. 6, 1862 Crosfield, Wm., jun., 28, *Temple st., and 11A, Rake lane.*

Feb. 8, 1864 Cuthbert, J. R., 40, *Chapel-street, and 40, Huskisson-st.*

Jan. 26, 1857 Dadabhai Naoroji, Professor of Gujarati, London University, 32, *Great St. Helen's, London, E.C.*

Nov. 2, 1863 Danson, J. T., *Liverpool and London-chambers, and Parkfield-terrace, Prince's-park.*

Nov. 2, 1863 Dawbarn, Wm., 4, *Chapel-street, and 99, Shaw-street.*

*April 6, 1840 Dickinson, Joseph, M.A., M.D. Dub., F.R.S., F.R.C.P. M.R.I.A., F.L.S., 92, *Bedford-street South.*

Nov. 27, 1848 Dove, Percy Matthew, F.S.S., 1, *North John-street, and Claughton.*

Nov. 27, 1863 Dove, Jno. M., *Royal Insurance Office, and Claughton.*

Jan. 23, 1848 Drysdale, John James, M.D., Edin., M.R.C.S., Edin. 41, *Rodney-street.*

Oct. 5, 1863 Drysdale, W. G., 7, *Elm-terrace, Beech-street, Fairfield, and 14, East-side Queen's Dock.*

Feb. 4, 1856 Duckworth, Henry, F.L.S., F.R.G.S., F.G.S., 5, *Cook-street*, and 2, *Gambier-terrace*.

*Nov. 27, 1848 Edwards, John Baker, Ph.D. Gies., F.C.S., Lect. on Chemistry, Liverpool Royal Infirmary Sch. of Med., *Royal Institution Laboratory*, and *Waterloo*. VICE-PRESIDENT.

Mar. 10, 1862 Ellison, Christopher O., *Adelphi-chambers*, *South John-street*, and *Esplanade*, *Waterloo*.

April 7, 1862 English, Charles J., 26, *Chapel-street*, and 26, *Falkner sq.*

Dec., 14, 1863 Erskine, Robert, 316, *Upper Parliament-street*.

Nov. 18, 1850 Evans, Henry Sudgen, F.C.S., 52, *Hanover-street*, and *Rainhill Mount*, *Rainhill*.

Feb. 24, 1862 Ewer, Harry Alexander, 21, *Harrington-street*, and *New Brighton*.

April 30, 1860 Fabert, John Otto William, 1, *Parliament-street*, and 3, *St. James's Mount*.

*Dec. 13, 1852 Ferguson, William, F.L.S., F.G.S., *Liverpool and London chambers*, and 2, *St. Aidan's-terrace*, *Birkenhead*.

Feb. 9, 1863 Finlay, William, Senior Mathematical Master, Middle School, *Liverpool College*, and 49, *Everton-road*.

April 18, 1864 Fischer, Hermann, *Royal Insurance Office*.

*April 3, 1837 Fletcher, Edward, 4, *India-buildings*, and 31, *High Park-street*.

*Mar. 19, 1855 Foard, James Thomas, 5, *Essex-court*, *Temple*, *E.C.*

*Feb. 6, 1854 Gee, Robert, M.D., Heidelb. M.R.C.P., Lect. on Patholog. Anat. Royal Infirmary Sch. of Med.; Physician, Workhouse Hospital; 16, *Oxford-street*.

Feb. 9, 1863 Giles, Rev. Edward, *Huyton-park*, *Huyton*.

March 4, 1861 Ginsburg, Rev. Christian D., LL.D. Glasg., 10, *Rake-lane*. VICE-PRESIDENT.

Dec. 2, 1861 Graves, Samuel R., *Baltic-buildings*, and *The Grange*, *Wavertree*.

Oct. 5, 1863 Gray, Jno. McFarlane, *Vauxhall Foundry*, and 80, *Prince Edwin-street*.

Nov. 14, 1853 Greenwood, Henry, 32, *Castle-st.*, and *Roseville*, *Huyton*.

Nov. 30, 1857 Grimmer, William Henry, 15, *Cable-st.*, and 64, *Grove-st*

Jan. 22, 1855 Hakes, James, M.R.C.S., Surgeon to the Northern Hospital, *Hope-street*.

Dec. 1, 1862 Hakes, Thomas, 20, *Castle-st.*, and 47, *Dean-st.*, *Edge-lane*.

Feb. 23, 1863 Hall, Charlton R., 17, *Dale-street*, and *Liscard Castle*, *Liscard*.

*Jan. 21, 1856 Hardman, Lawrence, 5, *India-buildings*, and *Rock-park*, *Rock Ferry*.

Feb. 9, 1863 Hart, Thos. Aubrey, M.A. Oxon, 81, *Bedford-st.*, *South*.

Jan. 13, 1862 Harvey, Enoch, 12, *Castle-street*, and *Greenheys, Riversdale-road, Aigburth*.

April 27, 1862 Hausburg, Friedrich Leopold Ludwig, *Rosenfels, Woolton*.

*Mar. 7, 1842 Heath, Edward, *Orange-court*, 37, *Castle-street*, and *St. Domingo-grove*, 114, *Breckfield-road N.*, *Everton*.

Dec. 12, 1855 Hess, Ralph, *Albany, Oldhall-street*, and 17, *Upper Duke-street*.

Dec. 28, 1846 Higgins, Rev. H. H., M.A., Cantab., F.C.P.S., *Rainhill*.

*Oct. 31, 1836 Higginson, Alfred, M.R.C.S., Surg. *Southern Hosp.*, 44, *Upper Parliament-street*.

Mar. 4, 1861 Hindley, Rev. H. J., M.A., 3, *Grecian-terrace*, *Everton*.

Nov. 16, 1863 Holden, Adam, 48, *Church-street*, and 5, *Towerlands-street, Edge Hill*.

Nov. 13, 1854 Holland, Charles, *Liscard-vale, New Brighton*.

*Dec. 14, 1862 Holt, Robert Durning, 6, *India-buildings*, and 2, *Rake-lane*.

Mar. 22, 1847 Horner, Henry P., 2, *Derby-square*, and 5, *Devonshire-road, Prince's park*.

Nov. 4, 1850 Howson, Rev. John Saul, D.D. Trin. Col. Cantab., Principal of the Liverpool College, *Shaw-street*, and *Dingle-park, Dingle lane*.

Dec. 27, 1841 Hume, Rev. Abrah., D.C.L. Dub., LL.D. Glas., F.S.A., 24, *Clarence-street*, *Everton*.

*Nov. 13, 1854 Hunter, John, Memb. Hist. Soc. Pennsylvania, *Halifax, Nova Scotia*.

Jan. 13, 1862 Hutchison, Robert, *Barned-buildings*, *Sweeting-street*, and 6, *Canning-street*.

Jan. 26, 1857 Hutton, David, 3, *St. George's-crescent*, and 61, *Canning-street*.

*Apr. 29, 1850 Ihne, William, Ph.D. Bonn, *Villa Felseck, Heidelberg*.

Feb. 23, 1867 Imlach, Henry, M.D. Edin., 1, *Abercromby-square*.

*Oct. 21, 1844 Inman, Thomas, M.D. London, M.R.C.P., Phys. Royal Infirmary, 12, *Rodney-street*, and *Spital, Cheshire*.

Mar. 10, 1862 Johnson, Richard, *Queen Insurance-buildings*, and *Brookfield House, Seaforth*.

Jan. 26, 1863 Johnson, Richard, jun., *Queen Insurance-buildings*.

Jan. 23, 1854 Jones, John, 28, *Chapel-street*, and 70, *Rodney-street*.

Mar. 9, 1863 Jones, Rev. Joshua, M.A. Oxon, Principal of the Liverpool Institute, 59, *Bedford-street South*.

*April 4, 1852 Jones, Morris Charles, *Queen Insurance-buildings*, and 75, *Shaw-street*.

Mar. 23, 1863 Jones, R. D., B.A., T.C.D., *Collegiate Institution*.

May 5, 1851 Jones, Roger Lyon, *Liverpool and London-chambers, Exchange*, and 6, *Sunnyside, Prince's-park*.

Feb. 19, 1855 King, Alfred, 14, *Newington*, and 9, *Netherfield rd. South*.

Jan. 10, 1848 Lamport, William James, 21, *Water-street*, and 5, *Beech-terrace, Beech-street, Fairfield*.

*Jan. 14, 1839 Lassell, William, F.R.S.S.I. and E., F.R.A.S. 27, *Milton-street*, and *Broadstones, Sandfield-park, West Derby*.

April 27, 1862 Lassell, William, jun., 27, *Milton-street*, and *Tue Brook*.

Oct. 21, 1844 Lear, John, 1, *North John-st*, and 22, *Holland-terrace, Duke-street, Edge Hill*.

Feb. 10, 1862 Leycester, Edmund Mortimore, Commander R.N., *Admiralty Office*, 2, *Drury-lane*, and 20, *Belvedere-road, Prince's-park*.

Dec. 10, 1860 Leyland, Joseph, *Williamson-square*.

Feb. 9, 1863 Lister, Edward, L.R.C.P.E., 6, *Beech-street, Fairfield*.

May 4, 1863 Lister, James, *Union Bank*, 6, *Brunswick-street*, and *Greenbank*, 166, *Breckfield-road North*.

Feb. 9, 1863 Loraine, Rev. Nevison, M.A., 1, *The Willows, Breck-road*.

Oct. 20, 1859 M'Andrew, James Johnston, 5, *North John-street*, and *Greenfield Cottage, Bromborough*.

*Oct. 21, 1844 M'Andrew, Robert, F.R.S., F.L.S., *Isleworth House, Isleworth, London*.

March 9, 1857 MacFie, Robert Andrew, 30, *Moorfields*, and *Ashfield Hall, Neston, Cheshire*.

April 20, 1863 Marples, David, 50B *Lord-street*, and 108, *Chatham-st*.

Jan. 21, 1839 Martin, Studley, 30, *Exchange*, and 109, *Bedford-st*.

Feb. 5, 1844 Mayer, Joseph, F.S.A., F.R.A.S., F.E.S., 68, *Lord-street*.

Jan. 12, 1863 Mellor, Rev. Enoch, M.A., 15, *Devonshire-road, Prince's-park*.

April 1, 1861 Melly, George, 7, *Water-street*, and 90, *Chatham-street*.

Oct. 31, 1859 Moore, Thomas John, Corr. Mem. Z.S., Curator Free Public Museum, *William Brown-street*.

Jan. 8, 1855 Morton, George Highfield, F.G.S., 9, *London-road*.

April 16, 1849 Moss, Rev. John James, B.A., *Upton, Cheshire*.

Oct. 29, 1850 Mott, Albert Julius, 19, *South Castle-street*, and *Holt-hill*.
 April 3, 1854 Mott, Charles Grey, 27, *Argyle-street*, *Birkenhead*, and
 2, *Shewell's-road*, *Holt-hill*.
 Oct. 20, 1856 Nevins, John Birkbeck, M.D., Lond., M.R.C.S., Lect.
 on *Materia Medica*, *Roy. Infirmary School of Medicine*, 25, *Oxford-street*, *VICE-PRESIDENT*.
 April 7, 1862 Newlands, Alexander, 6, *Rumford-place*, and 13, *Canning-street*.
 Dee. 15, 1851 Newlands, James, F.R.S.S.A., Borough Engineer, 2,
 Cornwallis-st., and *Elm Farm, Fairfield*.
 *Nov. 29, 1847 Nisbet, William, L.F.P.S.G., *Church-street, Egremont*.
 *Oct. 15, 1855 North Alfred, *Salcombe-hill, Sidmouth, Devonshire*.
 Nov. 18, 1861 Nugent, Rev. James, *Crosby*.
 Mar. 23, 1863 Page, Rev. George C., LL.D., *Gambier House, Fairfield*.
 Nov. 4, 1861 Philip, Thomas D., 49, *South Castle-street*, and 47,
 Prospect-vale, Fairfield.
 Dec. 28, 1846 Picton, James Allanson, F.S.A., Chairman of the
 Library and Museum Committee, 11, *Dale-street*,
 and *Sandy-knowe, Wavertree*. *PRESIDENT*.
 Feb. 6, 1854 Prange, F., *Royal Bank-buildings, Dale-street*, and 2,
 Grove-park, Lodge-lane.
 April 7, 1862 Rankin, Robert, Chairman of the Dock Board, 55,
 South John-street, and *Brombro' Hall, Cheshire*.
 †Mar. 13, 1812 Rathbone, William, 20, *Water-street* and *Greenbank*,
 Wavertree.
 Nov. 12, 1860 Rathbone, Philip H., 4, *Water-street*, and *Greenbank-cottage, Wavertree*.
 Mar. 24, 1862 Rathbone, Richard Reynolds, 21, *Water-street*, and
 Laurel Bank, St. Michael's-road.
 *Jan. 7, 1856 Rawlins, Charles Edward, Jun., 23, *Cable-street*, and
 1, *Windermere-terrace, Prince's-park*.
 *Nov. 17, 1851 Redish, Joseph Carter, 18, *Chapel-street*, and 19, *Hope-street*.
 Nov. 2, 1840 Robberds, Rev. John, B.A., 58, *High Park-street*.
 Jan. 25, 1864 Roberts, F. T., M.B., B.Sc., Lond., M.R.C.S., *Northern Hospital*.
 Feb. 10, 1862 Rogers, Thomas Law, M.D., M.R.C.P., Superintendent,
 County Asylum, Rainhill.
 Feb. 9, 1863 Ronald, Lionel K., 19, *Dale-st.*, & *Elm House, Edge-lane*.
 April 18, 1854 Rowe, James, 2, *Chapel-walks*, and 51, *Shaw-street*.

April 7, 1862 Samuel, Harry S., 2, *Canning-street*.
Jan. 11, 1864 Samuelson, James, 18, *Dale-street*, and 8, *Jubilee-street*,
Everton.
April 6, 1846 Scholfield, Henry Daniel, M.D., Oxon., M.R.C.S., 14,
Hamilton-square, Birkenhead.
Nov. 16, 1863 Sheldon, E. M., 256, *Vauxhall-road*.
Nov. 2, 1863 Skillicorn, John E., *Whitley-terrace*, 206, *Walton-road*.
Nov. 7, 1864 Skinner, Thomas, M.D. Edin., 1, *St. James'-road*.
*April 21, 1862 Smith, James, *Barkley House, Seaforth*.
†Mar. 13, 1812 Smith, James Houlbrooke, 28, *Rodney-street*, and *Green-
hill, Allerton*.
Feb. 23, 1863 Smith, J. Simm, *Royal Insurance Office, Dale-street*.
Feb. 24, 1862 Snape, Joseph, Lecturer on Dental Surgery, Royal
Infirmary School of Medicine, 75, *Rodney street*.
Nov. 12, 1860 Spence, Charles, 4, *Oldhall-street*, and 21, *Catherine-street*.
Feb. 10, 1862 Spence, James, 5, *Fenwick-street*, and 54, *Upper
Parliament-street*.
Dec. 14, 1857 Steele, Robert Topham, 4, *Water-street*, and 8, *Bedford-
street South*.
Dec. 2, 1861 Steinthal, Rev. Samuel Alfred, 59, *Rodney-street*.
May 2, 1864 Stitt, John Johnson, 17, *Water-street* and *Elm House, Anfield*.
Oct. 18, 1858 Stuart, Richard, 10, *Exchange-street East*, and *Brooklyn
Villa, Breeze-hill, Walton*.
*Feb. 19, 1855 Taylor, John Stopford, M.D. Aberd., F.R.G.S., 1, *Spring-
field, St. Anne-street*.
Jan. 23, 1843 Taylor, Robert Hibbert, M.D., Edin., L.R.C.S., Ed.,
Lect. on Ophthalmic Medicine, Royal Infirmary
School of Medicine, 1, *Percy-street*.
Dec. 11, 1854 Thompson, Samuel H., *Thingwall Hall, Knotty Ash*.
Nov. 17, 1856 Tinling, Chas., 60, *Custle-street*, and *Bedford-terrace*, 48,
Low-hill.
Nov. 26, 1860 Tooke, William H., *Church-street*, and *Wellington-street*,
Waterloo.
Dec. 1, 1851 Towson, John Thomas, F.R.G.S., Scientific Examiner,
Sailors' Home, 47, *Upper Parliament street*.
*Feb. 19, 1844 Turnbull, James Muter, M.D., Edin., M.R.C.P., Phys.
Royal Infirmary, 86, *Rodney-street*.
Oct. 21, 1861 Unwin, William Andrew, 11, *Rumford-place*, and
Newbie-terrace.

Oct. 21, 1844 Vose, James Richard White, M.D., Edin., F.R.C.P.,
Phys. Royal Infirmary, 5, *Gambier-terrace*.

Mar. 18, 1861 Walker, Thomas Shadford, M.R.C.S., 54, *Rodney-street*.

Jan. 27, 1862 Walmsley, Gilbert G., 50, *Lord street*.

Feb. 10, 1862 Weightman, John Hardham, 57, *Ranelagh-street*, and
27, *Baker-street, Low-hill*.

Dec. 2, 1861 Weightman, William Henry, *Leith Offices, Moorfields*,
and *Hapsford-lane, Litherland*.

Jan. 26, 1863 Whitelaw, George, *Collegiate Institution*.

April 7, 1862 Whittle, Ewing, M.D., Lecturer on Med. Jurisprudence
Royal Inf. Sch. of Med., 65, *Catherine-street*.

Nov. 2, 1863 Whitty, W. Alfred, "Daily Post" Office, and 8, *Catharine-
street*.

Oct. 29, 1855 Wilks, William George, 1, *Dale-st. and Mill-bank, Anfield*.

April 7, 1862 Willans, Thomas H., 82, *Rodney street*.

Nov. 18, 1861 Williams, Charles Wye, A.I.C.E., *The Nook, St.
James's Mount*.

Mar. 18, 1861 Wood, Geo. S., *Belle-vue-road, Wavertree*, and 20, *Lord-st.*

Feb. 9, 1863 Wood, John W., 81, *Church-street*.

Dec. 14, 1863 Zwilchenbart, Rodolph, Jun., *Queen Insurance Buildings*,
and 26, *Bedford-street South*.

HONORARY MEMBERS.

LIMITED TO FIFTY.

1812 Peter Mark Roget, M.D., Edin., F.R.C.P., F.R.S., F.G.S., F.R.A.S.,
F.R.G.S., &c., 18, *Upper Bedford-place, London*.

1819 John Stanley, M.D., Edin., *Whitehaven*.

1827 Rev. William Hincks, F.R.S.E., F.L.S., Professor of Natural
History in University College, *Toronto, C.W.*

1828 Rev. Brook Aspland, *Dukinfield, Cheshire*.

1833 The Right Hon. Dudley Ryder, Earl of Harrowby, K.G., D.C.L.,
F.R.S. *Sandown-hall, Staffordshire*, & 39, *Grosvenor-
square, London, W.*

1833 James Yates, M.A., F.R.S., F.L.S., F.G.S., &c., *Lauderdale House,
Highgate, London*.

1835 George Patten, A.R.A., 21, *Queen's-road West, Regent's-park, London*.

1835 William Ewart, M.P., *Cambridge-square, Hyde-park, London*.

1835 The Right Hon. Lord Brougham and Vaux, M.A., D.C.L., F.R.S., Chancellor of the University of Edinburgh, 4, *Grafton-street, London, W.*, and *Brougham Hall, Penrith*.

1837 The Most Noble William, Duke of Devonshire, K.G., M.A., F.R.S., F.G.S., &c., Chancellor of the Univer. of Cambridge, *Devonshire House, London, W.*, and *Chatsworth, Derbyshire*.

1838 George Biddell Airy, M.A., D.C.L., F.R.S., Hon. F.R.S.E., Hon. M.R.I.A., V.P.R.A.S., F.C.P.S., &c., Astronomer Royal, *Royal Observatory, Greenwich*.

1840 James Nasmyth, F.R.A.S., *Penshurst, Kent*.

1840 Richard Duncan Mackintosh, L.R.C.P., *Exeter*.

1841 Charles Bryce, M.D., *Glasg.*, Fell.F.P.S.G., *Brighton*.

1844 J. Beete Jukes, M.A., F.R.S., M.R.I.A., F.G.S., Local Director of the Geological Survey of Ireland, 51, *Stephen's-green, Dublin*.

1844 T. P. Hall, *Coggeshall, Essex*.

1844 Peter Rylands, *Warrington*.

1844 John Scouler, M.D., LL.D., F.L.S., *Glasgow*.

1844 Thomas Rymer Jones, F.R.S., F.Z.S., F.L.S., Professor of Comparative Anatomy, *King's College, London*.

1844 Robert Patterson, F.R.S., M.R.I.A., *Belfast*.

1844 Sir Charles Lemon, Bart., M.A., Cantab., F.R.S., F.G.S., *Penrhyn, Cornwall*.

1844 William Carpenter, M.D., Edin., F.R.S., F.L.S. F.G.S., *Registrar, London University*.

1847 Sir William Rowan Hamilton, LL.D., Hon. F.R.S.E., M.R.I.A., F.R.A.S., F.C.P.S., Astronomer Royal for Ireland, *Dublin*.

1848 Rev. Thomas Corser, M.A., *Strand, Bury*.

1850 Rev. St. Vincent Beechey, M.A., Cantab., *Worsley, near Eccles*.

1851 James Smith, F.R.S.S.L. and E., F.G.S., F.R.G.S., *Jordan-hill, Glasgow*.

1851 Henry Clarke Pidgeon, *London*.

1851 Rev. Robert Bickersteth Mayor, M.A., Fell. St. John's Coll. Cantab., F.C.P.S., *Rugby*.

1852 William Reynolds, M.D., *Coed-du, Denbighshire*.

1853 Rev. James Booth, LL.D., F.R.S., &c., *Stone, near Aylesbury*.

1857 Thomas Jos. Hutchinson, F.R.G.S., F.R.S.L., F.E.S., H.B.M.
Consul, Rosario.

1861 Louis Agassiz, Professor of Natural History in Harvard University,
Cambridge, Massachussets.

1861 William Fairbairn, LL.D., C.E., F.R.S., *Polygon, near Manchester.*

1861 Rev. Thomas P. Kirkman, M.A., F.R.S., *Croft Rectory, Warrington.*

1862 The Right Rev. H. N. Staley, D.D., Bishop of Honolulu,
Sandwich Islands.

1863 Edward J. Reed, Chief Constructor of H.M. Navy, *Admiralty*, and
Hyde Vale, Greenwich, S.E.

A S S O C I A T E S.

LIMITED TO TWENTY-FIVE.

Dec. 2, 1861 Captain James Anderson, R.M.S.S., "China," Cunard
 Service, 34, *Richmond-terrace, Everton.* (Atlantic.)

Jan. 27, 1862 Captain John H. Mortimer, ship "America." (Atlantic.)

Mar. 24, 1862 Captain P. C. Petrie, "City of London," Commodore
 of the Inman Line of American Steam Packets.
 (Atlantic.)

Feb. 9, 1863 Captain James P. Anderson, First Officer R.M.S.S.
 "China," Cunard service, *Commercial Hotel, Dale-st.*
 (Atlantic.)

Feb. 9, 1863 Captain John Carr (Bushby & Edwards) ship "Scindia,"
 43, *Hope-street.* (Calcutta.)

Feb. 9, 1863 Captain Charles E. Price, R. N. R. (L. Young and Co.)
 ship "Cornwallis" (Calcutta and Sydney.)

April 20, 1863 Captain Fred. E. Baker, ship "Niphon." (Chinese seas.)

TREASURER'S ACCOUNTS, 1862-63.

Dr.

Literary and Philosophical Society in account with ISAAC BYERLEY, Treasurer, to October, 1863.

Cr.

	£ s. d.	£ s. d.
To paid Brakell for printing "Proceedings"	81 9 0	By Balance from last account
" Tining for printing	14 12 1	128 Members' Subscriptions, at 21/- each
" Secretary's expenses of management, distribution of circulars and Proceedings, miscellaneous correspondence, parcels, messengers, inci- dents	19 17 6	" 9 ditto ditto, at 10/- each
" Account for wood-cuts	1 5 0	" Arrears
" Miscellanies	0 12 0	" 33 Entrance fees
" Secretary's Editorial fee	10 10 0	" 1 Life-Member's fee
" Mrs. Johnson for tea, coffee, &c.	14 5 8	" Interest on Dock bond
" Waiter's attendance	1 17 6	
" Collector's commission	6 9 0	
	<hr/> 153 18 3	<hr/>
To Balance carried down	225 7 5	<hr/>
	<hr/> £379 5 8	<hr/> £379 5 8
		<i>Errors excepted.</i>
Audited and found correct,		£200 0 0
ARNOLD BARUCHSON.		5 3 10
J. C. REDISH.		20 3 7
		<hr/> £225 7 5

PROCEEDINGS
OF THE
LIVERPOOL
LITERARY AND PHILOSOPHICAL SOCIETY.

ANNUAL MEETING.—FIFTY-THIRD SESSION.

ROYAL INSTITUTION, October 5th, 1863.

The REV. J. ROBBERDS, B.A., V.P., in the Chair.

The minutes of the last meeting having been confirmed,
The SECRETARY read the following

R E P O R T .

The Literary and Philosophical Society still continues to maintain the prosperous and flourishing attitude which it has assumed of late, and which was a source of such just congratulation in the last annual Report. It has now fairly entered upon the second half-century of its existence, and there seems no reason to doubt that it is destined to occupy a more conspicuous place than it has ever hitherto done in the literary and scientific history of the town. There have not, perhaps, occurred so many topics of interest during the last year as in the previous one ; but although the Report of the Council may not be so remarkable or so eventful, it has nevertheless to tell of a steady advance, and an increasing appreciation of the objects aimed at by the Society.

The accessions to the Society during the past year have been sufficiently numerous to render its stability a matter of no anxiety or doubt. Thirty-four new members have been enrolled, which, added to the thirty-nine elections of the previous year, produce the unprecedented total of seventy-three ordinary members elected during two consecutive sessions. The widening interest indicated by this fact is an important sign, independently of the impulse thus given to the Society through its finances, for the new members thus elected represent an additional sum of £48 6s. wherewith to meet last year's expenses, as well as a permanent addition of thirty-four guineas to our funds.

The Treasurer's statement, which will be presently submitted to you, will, as may be anticipated, show a very satisfactory condition of the Society's exchequer, and a vast improvement upon the position it exhibited three years since. The income of the past year, from all sources, has been little short of £200, a sum amply sufficient to carry on the ordinary expenditure of the Society without stint; whilst the reserve fund of £200 has been invested in a dock bond in the names of the Treasurer and Secretary, and thus amply secures the Society against any unforeseen accidents.

One honorary member and five associates have also been added to our list; but against all these accessions we must place the loss of fourteen ordinary members by *resignation* from various causes, and one by *death*. Among the former was an active member of our Council and contributor to our Proceedings, the loss of whom we much regret—Dr. David Walker, who quitted Liverpool last winter on a scientific mission to a distant part of the world.

The present numerical position of the Society is as follows: There were on the list at the end of last session 165 ordinary members; at the present time it includes 184 ordinary members, of whom 27 are life members, the number of actual

subscribers being therefore 157. To these, if we add 39 honorary members and 8 associates, our total numbers appear to be 231.

Only one member has been removed by death during the past year, but that member has been identified with the Society in a remarkable manner, although latterly he did not often appear amongst us. This was Dr. Duncan, the late medical officer of health for the borough, whose paper "On the physical causes of the high rate of mortality in Liverpool," read before the Society in February and March, 1843, and afterwards published, was the means of calling attention to sanitary questions in so prominent a manner, that to it may be distinctly traced the movement which resulted in the passing of that most important act of Parliament usually known as the "Health of towns bill." Dr. Duncan was for more than a quarter of a century a member of the Society, and formerly a very active one, having for several years filled the important post of Treasurer. Of late years, failing health greatly impaired his natural activity, and having visited Scotland in the spring with the hope of benefiting his constitution, he expired suddenly at Elgin, in May last.

Although, however, happily, neither by resignation nor by death, we have yet lost from among us a gentleman whose place it will be difficult to fill, by the retirement to his native country of Dr. Ihne, the president of the Society. A member of the Society for 13 years, Dr. Ihne has ever taken an active interest in its progress and usefulness, and has from time to time contributed, from his stores of classical and philological learning, papers of the greatest interest and value. Few scholars possess a wider, and withal a sounder, knowledge of the branches of literature he specially cultivated, and his departure will be felt by the Society as no less involving the loss of a profound scholar than of a true-hearted gentleman. Dr. Ihne has several times occupied the position of vice-

president, and at the last annual meeting, he was unanimously elected to the rank of President. Instead, however, of filling the chair for three years, he has, to our regret, been obliged to resign it at the end of the first session, and is now settled on the banks of the Neckar, and in the classical atmosphere of Heidelberg, whither the best wishes of the Society follow him.

The retirement of Dr. Ihne leaves the presidential chair vacant, and you will be called upon this evening to exercise your votes in the election of a worthy successor from the general body of the Society.

The volume of Proceedings for the past session is nearly ready, and will shortly be in the hands of the members. Though not quite so large as those of recent years, the matter will be found no less varied than instructive. From various circumstances only half the papers read during the session have been printed entire—a proportion which is somewhat smaller than usual.

The Society's library continues to be increased, and more especially by transactions of foreign societies, which are often difficult of access. It is hoped that before the end of the year the obstacles which have hitherto intervened may be removed, and the promised bookcases may be constructed. When that has been accomplished there will be no further delay in the cataloguing of the books, the completion of series, and the general availability of the library to the members at large.

The delegates from the Society to aid in the management of the Gallery of Inventions and Science have to make a more favorable report than heretofore. The gallery has been furnished by the aid of liberal subscriptions, and was opened to the public on the occasion of the marriage of the Prince of Wales, 10th March last. It now contains a large number of interesting models and inventions which have been deposited

by the owners or patentees, and form a very interesting collection. The Committee are of opinion that it only requires to be more widely known among inventors to cause it to become a very valuable and useful institution ; and this they hope that time will gradually effect.

The only important change in the conduct of the Society, made during the last session, was the passing of a bye-law, providing for the admission of ladies to the meetings on certain occasions, to be fixed upon by the Council. This plan has been tried, and found to operate very successfully. During the session four meetings were held at which the papers were of sufficient general interest to warrant the Council in inviting ladies. An average attendance of upwards of twenty-five ladies was the result, besides a considerably increased number of members and friends. The publicity thus given to the Society and its objects appears to warrant the continuance of the custom, and abundantly to counter-balance the small additional expenditure involved in providing refreshments for the increased numbers.

The annual dinner of the Society was held at Rock Ferry in the latter part of May, and although, owing to unfortunate weather, the attendance was not large, sufficient encouragement was given as to lead the Council to believe that such social meetings of the members of the Society are highly desirable.

It is desired to draw the attention of the Society to the forthcoming tercentenary anniversary of the birth of our great national poet and dramatist, William Shakspere, which will occur on the 23rd April, 1864. Such an interesting event is being naturally seized upon by the *literati* of all classes and all tenets, and the National Shakspeare Committee now includes nearly every man of eminence in the literary world. Moreover, branch committees are being formed in all the principal towns, and the Council would wish the members of the Society to combine in some way, to be hereafter delibe-

rated upon, in order that Liverpool may not be wanting in its homage to the genius which has ennobled the national character, and through it the whole human race.

The number of papers promised for the forthcoming session leads to the hope that there may be ample material for discussion at the meetings, and also that the Proceedings will experience no decline in interest or usefulness. At the same time your Council wish to impress upon the members of this Society the importance of keeping up the standard of the papers which go forth to the literary and scientific world as the product of the session's work. Nor is it sufficient that the standard be merely maintained as a stationary one,—it is necessary that it should be advanced and improved each year, if we would keep pace with other publishing Societies, and maintain a position worthy of the enterprise and intelligence of the town whose science and literature we represent. The Council especially invite brief communications upon subjects of original research, feeling assured that the interest of the meetings and the durability of the published papers alike depend upon the originality and freshness of the matter brought before the Society.

In conclusion, and in compliance with Law 36, the retiring Council recommend the five following gentlemen for election upon the Council for the ensuing year, viz. :—Dr. J. B. Edwards, F.C.S. ; Mr. J. T. Towson, F.R.G.S. ; Mr. Chas. Edwd. Rawlins, jun. ; Mr. James Birch, and Mr. S. H. Behrend, M.A.

(Signed)

J. ROBBERDS, V.P.

CUTHBERT COLLINGWOOD, Hon. Sec.

It was moved by Mr. HIGGINSON, and seconded by Dr. HIBBERT TAYLOR—“That the Report now read be adopted, and that the portion relating to the late Dr. Duncan be

extracted, and sent, with the regretful remembrances of the Society, to his widow."

The TREASURER then presented his accounts, audited by Mr. Baruchson and Mr. Redish.

Moved by Mr. REDISH, seconded by Rev. W. BANISTER, and carried—"That the accounts now presented be passed."

The following office-bearers were then elected :—

President (for three years) :

JAMES A. PICTON, F.S.A.

Vice-Presidents :

J. BIRKBECK NEVINS, M.D.

REV. C. D. GINSBURG, LL.D.

J. BAKER EDWARDS, Ph.D., F.C.S.

Treasurer :

ISAAC BYERLEY, F.R.C.S., F.L.S.

Hon. Secretary :

CUTHBERT COLLINGWOOD, M.A. and M.B. (Oxon), F.L.S., &c.

The following gentlemen were also elected members of the Council :—

Rev. J. Robberds, J. C. Redish, Alfred Higginson, Rev. H. H. Higgins, Arnold Baruchson, J. T. Towson, Charles E. Rawlins, jun., James Bireh, and S. H. Behrend, M.A.

Messrs. W. G. Drysdale and J. M'Farlane Gray were balloted for, and duly elected ordinary members of the Society.

The following gentlemen were elected to act as delegates from the Society to act on the Committee for the Management of the Gallery of Inventions :—Mr. A. Higginson, the Rev. Dr. Ginsburg, the Rev. J. Robberds, Dr. Nevins, and Dr. Collingwood.

The consideration of the approaching Shakspere Tercentenary, which was to have been discussed at this meeting, was postponed for want of time.

FIRST ORDINARY MEETING.

ROYAL INSTITUTION, October 19th, 1863.

J. BIRKBECK NEVINS, M.D., V.P., in the Chair.

It was announced from the Council that the Secretary had been requested to communicate with the Central National Shakspeare Committee, in order to learn how the Society could best co-operate with them in the celebration of the forthcoming tercentenary festival.

The Rev. Joshua Jones, M.A., was elected upon the Council in the place of Mr. C. E. Rawlins, jun., resigned.

Captains James Anderson, Mortimer, P. C. Petrie, J. P. Anderson, C. E. Pryce, John Carr, and F. E. Baker, were re-elected Associates, on the recommendation of the Council.

Dr. Edwards drew the attention of the members to some new forms of Geissler's vacua tubes, which exhibited the electric discharge by induction, producing two negative poles, one at each terminal, illustrating the peculiar disposition of the force in certain bar magnets, which exhibited poles of similar polarity at either end. He also showed a new form of throat tube, for surgical operations by aid of the electric light; and a form of "miner's lamp" illuminated from the same source.

Mr. Turner exhibited some remarkable sheets of a substance having the appearance of tissue paper, which were found at the bottom of a biscuit chest by Captain Morison. There were abundance of grubs; and Mr. Byerley and Dr. Collingwood having examined it by the microscope, gave their opinion that it was of insect origin. The substance caused great interest among the members, and various opinions were given as to the possibility of its production by insects.

A paper was then read by the Rev. Dr. Ginsburg, on

"THE KABBALAH."*

* This paper will be found at the latter part of the present volume.

SECOND ORDINARY MEETING.

ROYAL INSTITUTION, 2nd November, 1863.

The Rev. C. D. GINSBURG, LL.D., V.P., in the Chair.

The Council had invited ladies to the meeting, which was very largely attended.

The following gentlemen were balloted for, and duly elected members of the society :—

Messrs. J. T. Danson, J. M. Dove, Wm. Dawbarn, Wm. Alfred Whitty, Jno. E. Skillicorn and A. Billson.

The Rev. H. H. Higgins and Mr. J. T. Towson made some observations upon the formation of hail.

The following communication was read from Professor Elliot :—

“ The following interesting fact is too important to be lost sight of, especially as it may soon be covered up from view, and as no geologist as yet appears to have noticed it :—

“ In a direct line with Windsor street the open valley is crossed by a long mound of mouldering sandstone, carted from the new railway cutting. The mound is crossed at its south end by a cart road. Turning eastward along that, at about seventy yards from the mound, you see a hollow from which the earth has been taken to make bricks, and in the hollow two smooth platforms of altogether about a quarter of an acre in extent, or somewhat less. Looking down upon it you see numerous streaks, perfectly straight and parallel, running, I think, nearly north and south, by the compass. These you take at first to be marks left by removed rows of bricks. On going nearer, however, you find that the platform is of cleared rock, and that the marks are cut in the rock itself. Your next impression is that they are the edges

of numerous thin strata, 'cropping out' on the surface. But their perfect straightness precludes that supposition, unless the strata had been nearly vertical, which they have no chance to be there. If you examine them more closely you will find that they have no cracks or other continuations below the surface ; that they have no differences of colour ; that they do not coincide with any line of stratification, unless in one instance for a short way, soon leaving it, and not turned by it an inch out of their straight direction ; and that they are, in fact, grooves ploughed in the solid rock, which has been previously planed smooth. They are undoubtedly markings of that kind attributed now by geologists to glaciers and icebergs, whether correctly or not I do not pretend to say. Whether or not, they are the finest specimens of that kind which I have ever seen ; and I think it right to draw attention to them before the ruthless brickmakers, who care for none of these things, immerse them in water or cover them up again with earth ; and I invite all who have any doubt of my testimony to go and see for themselves.

"I may add that, in the detached portion to the northwest, the same markings continue equally numerous, straight, and parallel, and in the same line with the others, and it is not improbable that they extend below the soil over the whole of the Parliament-fields, judging from their remarkable flatness. In the detached portion there are a few other grooves, also perfectly straight and parallel, but crossing the former at an angle of about 45 degrees. There are also numerous short marks, as if made with picks, cutting the first-mentioned at a uniform angle of about 85 degrees. It is scarcely possible that they can be pickmarks. The *principal* lines are *assuredly* not artificial, but, whatever their origin, have been cut by some hard substances sliding along under tremendous pressure."

A paper was then read (illustrated by numerous experiments) on the following subject :—

THE WORLD AS IT MIGHT HAVE BEEN ;
OR, THE JEWISH AND HEATHEN COSMOGONIES CONTRASTED
BY THE LIGHT OF MODERN SCIENCE.

By J. BIRKBECK NEVINS, M.D. Lond., V.P.

THIRD ORDINARY MEETING.

ROYAL INSTITUTION, November 16th, 1863.

JAMES A. PICTON, Esq., F.S.A., President, in the Chair.

Messrs. E. M. Sheldon and Adam Holden were balloted for, and duly elected members.

A further communication was read from Professor Elliot relative to the supposed glacier markings in Parliament-fields, as follows :—

“ I have since discovered a continuation of the same grooved surface in three places near each other, from 20 or 30 to somewhere about 100 yards to the northeast of the principal place, and, in fact, wherever you can see the surface of the rock below the brick earth. The markings in these places are by no means faint, but even more deeply cut than the first, and go so far to confirm my conjecture that probably the whole level tract, of which the Parliament-fields form a part, is a table planed flat by Nature’s grand planing or ploughing machine, whatever it was.

“ In writing the previous letter I was not aware that Mr. Morton had previously discovered and described other similar impressions in the neighbourhood of Liverpool. But no

matter, this is one added to the number, and that on a very grand scale, and very conveniently situated for further observation."

Mr. A. HIGGINSON exhibited a rubbing of one of these markings, showing well their general character, and made some observations upon the general question, based upon an inspection of the spot.

Mr. MORTON said he had traced glacier markings in six different places round Liverpool.

The PRESIDENT and Mr. NISBET having made some further remarks, the subject was dropped.

Dr. COLLINGWOOD called attention to a report of the meeting of the Entomological Society, in the *Athenæum*, relative to the web exhibited at a former meeting of this society, as follows:—"Professor Westwood exhibited a large sheet of delicate white silky matter, like tissue paper, but extremely soft and smooth like the very finest kid; it had been sent to him by Dr. Collingwood, and was taken from the bottom of a biscuit-chest, the biscuits themselves having been attacked by larvæ, which were described as dipterous in appearance. It was thought, however, that the larvæ were lepidopterous, and that the silky web was the work of *Tinea granella*.

The President, James A. Picton, Esq., F.S.A., on taking the chair for the first time, read the following

INAUGURAL ADDRESS.

GENTLEMEN,

I have to thank you most sincerely for the honour you have conferred upon me in electing me to the office of President of the Literary and Philosophical Society. The chair which has been filled by Roscoe, Traill, and Yates, and since by many men of eminence still living, is a position which any one may well feel proud to occupy. Whatever may be my shortcomings, I can assure you that I bring with me a sincere and earnest desire to discharge the duties of the office in a satisfactory manner, and I trust to your kindness and good feeling to extenuate any involuntary deficiencies.

The history of this society has been so well elucidated on the recent occasion of its jubilee, that it would be superfluous in me to make any special reference to it on the present occasion, but there are certain aspects connected with its past history and present position to which it may be desirable to call your attention.

When the Literary and Philosophical Society was established about fifty-two years since, it was, I believe, the only one of its kind in the town, and was intended to embrace the whole circle of intellectual and scientific pursuits. At that period, when the population of the town was not more than one-fifth of the present, it could not be expected that there would be scope for the establishment of societies devoted to distinct and special studies, whether of literature, science, or art. It was, therefore, a wise and prudent step which was taken by the founders in giving to it as extensive and catholic a character as possible, and the success which attended its operations during so many years is the best justification of the course. Time, however, brings with it its usual changes; the fertilising stream of one age, if

neglected, becomes the stagnant pool of the next. All institutions require perpetual adaptation to the changing aspects of the times ; or it may rather be said that the progress of events insensibly and necessarily moulds institutions according to the requirements of the day.

The great and manifold advantages of a society devoting itself exclusively to one particular science or pursuit are so obvious that it cannot be surprising that gradually there have grown into existence societies of this class. There is a certain *esprit du corps*, a common feeling, where the subjects are limited, and all the ideas, as it were, radiate from a common centre, which makes a society of this kind very attractive. Accordingly, we have witnessed the establishment of the Chemical, the Architectural and Archæological, the Polytechnic, the Geological, the Social Science, and, although more catholic in the sphere of its action, the Historic, Societies. These, all in their several departments, have done good service to the cause of science and literature, and we sincerely wish them to go on and prosper.

It may then be asked, if each department has its own representative society, labouring in its vocation with diligence and zeal, what remains for the Literary and Philosophical Society ? Has it not answered its purpose in its day, and would it not be well to retire with dignity, and leave the field open to the special votaries of each particular science ? I wish to present a few reasons why, as it appears to me, not only would this be unadvisable, but that in the course which science and literature appear to be taking, societies occupying the extensive platform laid down by the Literary and Philosophical, are more than ever required.

As the boundaries of each science and art extend, they are found to touch at various points on other and kindred ones ; the limits which divide them become fainter and fainter, until it is found impossible to determine where the one ends and the

other begins. At the present period no science or study can stand alone ; its resources have to be drawn from a wider and ever extending field ; so that whilst the vast expanse of knowledge requires more and more a division of labour for its cultivation, the necessity of co-operation and mutual aid becomes continually more apparent. If we take the oldest and probably the sublimest of the sciences, that of Astronomy, we find involved with it, from the earliest period, mathematics and geometry ; optics, and the construction of optical instruments, next came in aid, and of late, chemistry has most unexpectedly and opportunely contributed most powerfully towards the elucidation of the structure of the heavenly bodies, and to what may be called the "solidarity" of the solar system. I know of nothing more beautiful in the history of scientific progress than the application of the spectrum analysis to the discovery of the materials existing in the solar and stellar atmospheres. If from astronomy we turn to geology, we find this science assuming dimensions so large as almost to appropriate to itself the services of several other independent departments of inquiry. Botany, anatomy, vegetable and animal physiology, conchology, meteorology, chemistry, the nature and extent of dynamic forces—all pour in their several streams to swell the tide of progress, and latterly the boundary which formerly appeared intangible and unapproachable, connecting geological changes with the history of the human race, is beginning to be dimly defined and laid down.

Without going through the entire circle of the sciences, we find this communion and interpenetration everywhere taking place. Sometimes the coincidence and illustrations thus arising are of the most unexpected and striking character. Who could have supposed, for instance, that there was anything in common between the study of geology and the newly-established science of language, or that anything could be contributed by the one in elucidation of the other ? and yet

such is demonstrably the fact. Geology shows, in examining the most recent deposits on the earth's surface, that the forests which once covered a great part of Europe have been successive in their development ; that is, that the fir, and the oak, and the beech have prevailed at different periods, the date and continuance of which were unknown and without a clue. Professor Max Müller has recently shown by a comparison of the terms employed in each language traced to its earliest sources, the state of the respective countries in this respect at the time of their first occupation, and the order of precedence and succession, thus connecting in the most interesting manner the latest geological epochs with the earliest condition of prehistoric man. The connection of the physical sciences has been so amply illustrated by Mrs. Somerville, Sir John Herschel, and others, that it is unnecessary to dwell upon it ; but every year it is receiving fresh developments. The recent calculations of Sir William Armstrong as to the probable duration of our coal-fields, to which England owes so much of her greatness and power, have naturally excited considerable alarm as to the future of our country ; but just at this juncture the grand and noble theory of the identity of heat and motion, and the convertibility of the phenomena of the one into those of the other, points most opportunely in the direction from whence probably a solution of the difficulty may arise. Indeed, no discovery in any department of inquiry ever takes place without communicating an impulse, and giving either a practical application, or a stand-point for further progress in some other.

Nor is this mutual connection and support confined exclusively to scientific pursuits. We find it in literature of every class. History is no longer studied as a detail of battles and sieges, and a mere narrative of events. It brings to its aid illustrations drawn from climate, race, temperature, physical geography, mineral productions, and all the natural or adven-

titious circumstances which influence human habits and conduct. In this respect the late Mr. Buckle may be said to have founded a new school, which will no doubt stimulate others to follow in the same track, with less prejudice and greater impartiality. Even poetry and the ornamental arts have felt the influence of this expansive spirit. Any one who will carefully study the works of our Poet-Laureate, and the school of which he is the founder, will find a far greater breadth of illustration, and a far wider extent of resources, than are to be found in our older poets. I am, of course, not entering into their respective merits, but merely stating a fact. In Painting, the same influence is shown by a greater absence of conventionalism, and a far more extensive choice of subjects for treatment than formerly prevailed.

I have thus rapidly endeavoured to show that whilst every mental pursuit may be followed with ardour, for its own sake, there is at the same time a ground common to all, arising from the fact that the mind is one and undivided, however various its faculties may be. Like the rays of the sun when separated in the prismatic spectrum, each has its office to perform of usefulness and beauty, in the rich colouring of nature, in the quickening power of warmth and chemical influence, but it is only when united in the glorious rays of the fountain of light that they appear in all their splendour and brilliance.

A platform of this kind is, as it appears to me, provided by the Literary and Philosophical Society, and in this way I think its influence may be most beneficially exercised. The geologist and the classical scholar, the student of history and the mathematician, the natural philosopher and the poet, can here meet on common ground, and by mutual intercourse add to each other's stores of information, and contribute to the common cause of mental progress. It is desirable to see how our favourite speculations and studies appear in the eyes of others who look at them from a different point

of view, and free from the particular relations in which we have been in the habit of contemplating them. There is also a great advantage in having a centre of union for men of thought in every department, where mind can sharpen mind, and the faculties be kept in active exercise. There is great need for a union of this kind in a town like Liverpool, so exclusively devoted to commerce.

The question has often been discussed as to the nature and extent of the influence exercised by business pursuits on intellectual life and progress. On the one hand it is asserted that the activity and energy engendered by commercial pursuits will give a capacity and power capable, when turned in a mental direction, of producing great results ; that almost all progress in the arts of life has been developed in the great centres of population ; that the quickening and stimulating influences of mind acting upon mind, which is found in its greatest extent in our crowded cities, must be favorable to mental progress. It may also be said that every community, whether ancient or modern, in which art, literature, or philosophy, have flourished, has been more or less commercial or manufacturing in its character. Athens, Rome, Alexandria of old, Florence and Venice in the mediæval period, and London and Paris in more modern times, may be mentioned as not more distinguished by their fame in literature and art than for their commercial and industrial successes. It is to Lorenzo the Magnificent, a Florentine merchant, that the restoration of learning and the arts is more indebted than to any other single individual. Gibbon says of him that "his credit was ennobled into fame, that his riches were dedicated to the service of mankind, and that he often imported in the same vessel a cargo of Indian spices and Greek books." All this is, no doubt, true ; but there are causes operating in more modern times, and particularly amongst ourselves, which present the subject in a more unfavourable light. Commerce

is now conducted on a larger scale, and requires far more undivided attention than formerly. There is a tendency to centralisation and combination in every department. Every community is distinguished by some special pursuit which gives its character to the locality; and the elements, which are discordant from the general object, are gradually eliminated, and drawn elsewhere. Liverpool is essentially commercial—all her interests are bound up with foreign trade. The large operations which are here successfully carried on require a power of mind, and strength of character which are capable of great things, but which are almost entirely absorbed by the daily calls of the exchange and the counting-house. When we add to this the transaction of public business, to which many must necessarily devote themselves, and the claims of the various religious and charitable associations on the time as well as money, of our townsmen, which claims (it may be said to their honour) are nowhere more cordially responded to,—the residue, which is left for the cultivation of science, literature, and the arts, is necessarily exceedingly small.

From this busy uncongenial atmosphere, so unfavourable to the quiet of the student, and so destitute of external aids, it is no wonder that the studious and learned man should make his escape to the vast resources of London, or to the quiet shades of our University towns. Sculptors, and painters, and men of genius have arisen amongst ourselves as well as in other places. The names of Gibson and Ansdell stand high in the rolls of artistic fame, and would do honour to any community; but, as a matter of necessity, the duties of their profession lead them elsewhere. Beyond even these causes, another is at work amongst ourselves, and constantly increasing; I mean the tendency of using the town merely for business, and living at a distance in the pure air of the country,—one of the greatest advantages which modern civilisation

affords, but which, nevertheless, has its drawbacks and penalties. Under these circumstances, I am afraid we must admit that the condition of things amongst ourselves is not so favourable as could be desired for the cultivation of literature and science. I say the *cultivation*, as distinguished from their diffusion. We live in a reading age, and, to a certain point, the minds of all our educated townsmen appreciate and enjoy the literature of the day ; but this merely receptive process is very different from that active pursuit of knowledge and thirst for the discovery of truth which constitutes what is properly termed study.

But, although I have thought it desirable candidly to acknowledge the peculiar difficulties which exist amongst us in working out thoroughly the objects of a society like this, I am by no means inclined to take a gloomy view of our condition and prospects. Whatever difficulties may exist in carrying out a noble object, there will always be found spirits endowed with temper and edge sufficient to cut their way through every obstacle. Comparatively, they may be few ; but in a large community like this their number in the aggregate will always be considerable. The very fact of the uncongeniality of atmosphere in which they move should only tend to unite them more closely in their common pursuit. Nor are there wanting many bright examples of success to encourage those who would brighten their daily path of commercial or professional toil by the pursuit of truth in its higher branches. Bailey, the astronomer, was a stockbroker in the city of London ; and our own list of members affords at least one name eminent in the same science, who, until recently, was engaged in commercial life in Liverpool. William Yarrell—whose works on Natural History place him in a very high rank as a student of nature, was all his life a newspaper agent in London. It would be invidious to mention the names of those living amongst us, or a goodly list might be made out

even in Liverpool, of men who, in spite of the deadening influences of daily routine, have raised themselves to a high position in the literary and scientific world.

In order to obtain the largest amount of benefit from an association of this nature, there are, I think, one or two leading principles to be kept in mind, which you will, I am sure, pardon me for mentioning, not as any novelty, but merely as bringing into more prominent and immediate notice, what we all are ready to admit. The first is *earnestness*. I mean by this, taking hold of some study or pursuit, and following it out resolutely and determinedly to its results. If this were kept in mind, the papers presented at our meeting, communicating these results, could not fail to be of the highest interest. It must be kept in mind that this society is not one for the diffusion of knowledge, but for the discovery of truth, an institution for mutual study, not for popular instruction. In this point of view I cannot but think that the plan which has been adopted of late, of throwing open our meetings, will have to be carefully watched. In itself the idea is an excellent one, and will be attended with good results in opening wider the portals of knowledge to those members of our families who are necessarily debarred from the means at our own disposal ; but, if carried too far, it cannot fail to have a relaxing tendency in substituting the polish of dilettantism for that muscle and nerve and energy which the study of the higher walks of truth will ever require. We ought to be pioneers in the van of science, not the mere distributors and parcelers out of the ground already won. This energy of purpose also ought to lead every one whose name is enrolled to see in what manner he can best contribute some scrap of material at least to the fabric of knowledge which we are all attempting to rear. Individually our attempts may be feeble ; but when united, each contributing according to his vocation, the result will be powerful and effective.

The second principle which we should ever bear in mind in the pursuit of our objects is *reverence*. The praises of knowledge scarcely need be sounded at the present day—

“ Who loves not knowledge? Who shall rail
 Against her beauty? Let her mix
 With men and prosper. Who shall fix
 Her pillars. Let her work prevail.
 Let knowledge grow from more to more,
 But more of reverence in us dwell,
 That mind and soul, according well,
 May make one music as before—
 But vaster.”

All truth is holy as it is an emanation from the God of truth. The more we know the more we feel our own ignorance. This is generally admitted; but there is something beyond this, that the more we know the more we feel the unsatisfying nature of merely intellectual as compared with moral truth. Pursued in this frame, all studies assume a higher and more dignified character. The faculties preserve their due subordination; and with this guiding clue, we may safely scale the highest peaks of knowledge, assured that our search shall not be in vain.

One other principle I would further briefly allude to—that of *mutual charity and forbearance*. There is a natural tendency in every mind, whatever our pursuits may be, to adopt a certain set of opinions—to run, so to speak, in a certain groove of thought—and any proposition which opens up a new view, inconsistent with the conclusions already adopted, jars upon our frame, disturbs our self complacency, and leads us to view the intruder as an enemy to our peace. This is not peculiar to any study, science, or art. Luther, in the 16th century, was hardly denounced in stronger terms for his heresy in doctrine than Harvey in the 17th, and Jenner in the 19th, for their heresies in physiology and medicine; and even at the present day the propounder of a new theory, the interpreter of the laws of nature in a new sense, has need either

to disguise his theory under the garb of an esoteric form, or be prepared to run the gauntlet of criticism frequently most unfair and uncandid. It is a notorious fact that there are no differences more bitter, no judgments more uncharitable than are to be found in the scientific and literary world. That this should be so is simply an infirmity of human nature, which should in every way be discountenanced and discouraged. When a new truth, or what professes to be so, is put before the world, the first enquiry usually is, not is it true—can it be proved? but, how does it square with our existing systems? Does it disturb that settled order, that labelled and ticketed arrangement of ideas with which we are familiar? If it does, then the course we often pursue is either to reject it as a heretical intruder and heap upon it ridicule and contempt, or to look upon it with coldness and suspicion until by slow and painful degrees it has won its way to notice and takes rank as a familiar axiom. Under such circumstances we ought to remember that all truth is essentially harmonious. No single truth, whatever be its nature, can by possibility contradict any other truth. However new, or harsh, or strange it may appear, it will ultimately be found to coincide and harmonise with every recognised principle which has its base on the same firm foundation. Let us hear the noble words of John Milton on this subject. He says in his "Plea for the Liberty of Unlicensed Printing," "Where there is much desire to learn, there of necessity will be much arguing, much writing, many opinions; for opinion in good men is but knowledge in the making. Under these fantastic terrors of sect and schism we wrong the earnest and zealous thirst after knowledge and understanding which God hath stirred up among us. * * * A little generous prudence, a little forbearance of one another, and some grains of charity, might win all these diligences to join, and unite into one general and brotherly search after truth; * * * I doubt not, if

some great and worthy stranger should come among us, wise to discern the mould and temper of a people and how to govern it, observing the high hopes and aims, the diligent alacrity of our extended thoughts and reasonings in the pursuit of truth and freedom, but that he would cry out as Pyrrhus did, admiring the Roman docility and courage : ‘ If such were my Epirus, I would not despair the greatest design that could be attempted to make a church or kingdom happy.’ Yet these are the men cried out against as schismatics and sectaries, as if, while the temple of the Lord was building, some cutting, some squaring the marble, others hewing the cedars, there should be a sort of irrational men who could not consider that there must be many schisms and many dissections made in the quarry and in the timber ere the house of God can be built. And when every stone is laid artfully together, it cannot be united into a continuity, it can but be contiguous in this world ; neither can every piece of the building be of one form ; nay, rather the perfection consists in this, that out of many moderate varieties and brotherly dissimilitudes that are not vastly disproportioned, arises the goodly and the graceful symmetry that commends the whole pile and structure.”

These are pregnant and powerful words, worthy of the great man who penned them. We are labouring, as he describes, in our humble way, “some cutting, some squaring the marble, others hewing the cedars,” but all, we trust, endeavouring to further the building of the great temple of truth. Nay, we may even be ignorant of the particular place which our work shall occupy, but if we be true men; labouring for the truth’s sake, we may be certain that our work shall find its place in that great temple of which we only see the foundations, but of which the crowning summit shall be developed in a glorious hereafter.

On the whole, then, notwithstanding the drawbacks to

which I have slightly made allusion, I do not think there ever was a period when our position as a society was more prosperous or our prospects brighter. Amongst other causes for this may be mentioned the constant influx into the town of men of intelligence and education, who find Liverpool a fit arena for their energy and enterprise, and who bring amongst us new blood, so to speak, of a vigorous and healthy character. Intelligent strangers have always found amongst us a warm and cordial welcome, and have contributed very largely to render the town and its institutions what we now see them. Within these walls, dedicated for so long a period to the cause of science and literature, they will ever be honoured guests, until they become merged into active participants of our studies and pursuits. If we desire tangible proofs of the results of the society's career, we may point with satisfaction to the published proceedings, which contain a varied and most interesting series of papers on a large number of subjects, both of literature, science, and art. These will necessarily increase in interest as years roll by, and will form a very valuable history of the progress of thought in this locality on a vast variety of subjects. It is not too much to say that the published transactions of the Liverpool societies, including the Historical, the Architectural, and the Literary and Philosophical possess an interest and value surpassed by those of no other provincial society in the kingdom. Many of them have been extracted and published elsewhere, and several translated into foreign languages. I trust that this will be borne in mind by our members, and that in all the papers presented, the prospect of publication will always be kept in view.

Another feature of our meetings which has always possessed high interest, is the literary and philosophical intelligence which usually occupies the earlier portion of our proceedings. The free interchange of thought proceeding from this source,

the information communicated and the discussions arising, have always appeared to me to possess great value. Hints are dropped, which, falling like seeds into fertile soil, are developed into thoughts and ideas, which expand and bear fruit in future days. May we hope that this portion of our usual proceedings will during the ensuing session receive its due share of attention.

When we contemplate the present state of the civilised world, in its relation to science, there appears to be great cause for congratulation. Man appears to stand on an eminence which rises higher and higher with each successive victory over the powers of nature. He seems to have realised the description given by the Psalmist—"Thou hast made him a little lower than the angels, and crowned him with glory and honour. Thou madest him to have dominion over the works of thy hands; thou hast put all things under his feet." What is there which is not subservient to his behests? The winds and the waters are his captive slaves to grind his corn, to saw his wood, to turn his machinery, to speed his way; the sun paints his pictures; the bowels of the earth yield their long accumulated treasures of power in our coal and iron; the very lightning is imprisoned and sped upon messages, like Puck—

"To put a girdle round the earth
In forty minutes."

The subtle laws of chemistry are invoked to analyse, combine, separate, and adapt the substances of which this earthly frame is composed, to his wants and pleasures. The everlasting hills, when interrogated, reveal the strange history of their formation and elevation. The earth beneath our feet turns over leaf after leaf in its record of ages too vast for calculation, and passes in review before our eyes pictures such as fancy could never have dreamed, of "gorgons and chimæras dire" which once had a real and living existence,

and were masters of the earth as we are now. Nay, the very sun and centre of our system is put to the question, and forced to reveal, to some extent at least, his nature and constitution, and worlds unnumbered are brought to light where all was previously thought to be empty space ; whilst at the other extremity a world of life and beauty has sprung into notice and regard, too minute to be perceived by his unaided organs. The vegetable and animal world, within certain limits, is modified and adapted to his wants and pleasures. Indeed, it seems impossible to set a limit to man's progress in physical science and his power over the material world. So far we stand on vantage ground never enjoyed by the world before.

In these pursuits the division of labour is of necessity carried to its utmost limits, and each pursues his own department almost exclusively. In the world of letters the case is somewhat different. The accumulation of literature on every subject capable of being illustrated is becoming something almost overwhelming to contemplate. Much of it from age to age is consigned to deserved oblivion, but much survives to such an extent at least as requires some knowledge of it by every man of education and cultivation. The great extent of this rendering its absolute mastery impossible by any single individual, has led to the establishment of another class of literature in the reviews and magazines from which abstracts and breviates are obtained of what it is impossible to read at length. Notwithstanding these aids, the amount of reading absolutely requisite to keep *au courant* with the age is probably greater than at any former period. Archbishop Thomson has recently touched on this subject in an address delivered at Leeds. There is no doubt that it is possible by too much diffusive reading, even of a healthy class, to weaken the fibre of the mind and unfit it for manly, vigorous thought. A society such as ours has a beneficial tendency towards correcting this

evil, in leading us to read for a purpose, to adopt method and order in our literary recreations, to select some subject for study and illustration, and endeavour to master at least its general principles, and thus contribute some little aid towards the general advancement. The difference between desultory reading and study is enormous. The one is like the inspection of a shifting panorama, which leaves on the mind a pleasing, but indefinite and shadowy sense. The other is like digging in a mine, where every stroke yields a return in treasure, amassed for future use.

I have alluded to the steady advance of physical science, and man's mastery over the elements. In mental science, meaning by that the study of our own minds and faculties, the same cannot be said. Here little, if any, progress can be shown to have been made. Political economy, which holds a middle place between physical and mental science, treating, as it does, of man's motives and habits, as developed by the pressure of his wants and interests, has become better understood; but, as a science, it is still far from perfect, and from its principles being established on an incontrovertible basis. Social science, which treats of man in his character of a domestic and social being, and of all that relates to his welfare as a member of society, has made considerable progress of late years, and has been the originating cause of many needful reforms. Pure mental science, however, still remains much as it has always been from the dawn of Greek philosophy. The reason is obvious. In all physical sciences the achievements of one age become the starting point of the next, and thus progress may be carried forward with an accelerated ratio; but in mental science, every age, every student must start from the depths of his own consciousness, and the writings and experience of former ages can only be of use as leading lines, which our own thoughts may traverse to form their own conclusions.

I must now bring to a close these desultory observations. My object has been, however imperfectly carried out, to indicate the position which this society may usefully occupy in the present condition of the scientific and literary world, and under the peculiar conditions which exist amongst ourselves. We have, I believe, a high and noble task to perform, in providing a means for soothing the asperities of daily life ; in enabling us to forget for a time the anxieties of business, and the irritations of the counting house ; in the cultivation of those faculties which God has given to us for nobler ends than the pursuit of business, however successfully, and the amassing of wealth, however enormous ; in the diffusion within our respective circles of a taste for whatever is beautiful in nature and art ; in calling attention to the wonders developed in the works of God around us ; and, finally, in contributing to the elevation of the tone of the mental and moral atmosphere about us. If we keep these objects steadily in view, the Literary and Philosophical Society cannot be said to have existed in vain.

This address was listened to with great interest, and at its conclusion a vote of thanks was carried by acclamation, on the motion of the Rev. H. H. Higgins, seconded by the Rev. J. Robberds.

FOURTH ORDINARY MEETING.

ROYAL INSTITUTION, November 30th, 1863.

JAMES A. PICTON, F.S.A., PRESIDENT, in the Chair.

Dr. COLLINGWOOD detailed some curious observations made by Col. Stuart Wortley upon the habits of Prideaux's hermit-crab and the Cloak Anemone (*Adamsia*.) These two animals, it is well known, are always associated together, but are difficult to keep in the aquarium. Col. Wortley had, however, succeeded, and had observed the attachment they appeared to have for one another, and had seen the crab feed the anemone when his own hunger was appeased, and remove it to a new shell when he himself removed.

The Rev. Dr. GINSBURG having taken the chair, the following paper was read :—

ON SANSKRIT ROOTS AND ENGLISH DERIVATIONS.

BY J. A. PICTON, Esq., F.S.A., PRESIDENT.

IN two papers previously read before this society, I have endeavoured to illustrate the identity of our own mother tongue, in all its essential elements, with the ancient Gothic, the earliest form of Teutonic speech handed down to us. I have also shown that the position which the Gothic language holds, presents great facilities for tracing the connexion of the Teutonic branch with the other great stems of the Aryan family of tongues, especially with the Greek, Latin, and Sanskrit. It is my purpose in the present paper to continue the inquiry, by calling attention to a few instances of the radical connexion still to be traced, between the members of the family most widely separated both by time and space; the one from the extreme East, and preserving in its grammatical character the earliest forms,—the Sanskrit; and the other, occupying the most advanced post to the West, and in many respects of the most modern development—our own English tongue. A few years ago any attempt of this kind would have been simply impossible, but the patient labours of the modern school of philology have done much towards removing the difficulties, by investigating the laws of language in its permutations, and by establishing principles which may be relied on in inquiries of this nature. Amongst these inquirers stands pre-eminent the name of Franz Bopp, the publication of whose *Vergleichende Grammatik*, the first part of which appeared in 1833, created an entirely new era in the science of Philology. Up to that time, etymology had been little

more than a series of guesses, frequently shrewd and acute, but based on no principle, and appealing to no general laws. Jacob Grimm, the commencement of whose *Deutsche Grammatik* was published in 1822, has exhausted the subject of the Teutonic languages in their co-relation and comparison, but to Bopp we owe the establishment of the laws of language on such sure and settled foundations, that future inquirers may tread firmly, and advance with confidence, where formerly every step was treacherous and uncertain. The labours of Bopp have been ably followed up by Professor F. Pott, of Halle, in his *Etymologische Forschungen*, (Lemgo, 1859,) and latterly in our own country by Max Müller, whose "Lectures on the Science of Language" have done much to draw the attention of the educated classes to the importance and value of philological studies, and the interest attaching to them. Hitherto, however, not much has been done towards tracing out the connexion of our own language with the earliest of its congeners. Bopp's *Comparative Grammar* has chiefly to do with principles, laid down in the most masterly way, but adapted only for scholars. Our own etymologists almost uniformly terminate their inquiries with the Anglo-Saxon, Latin and Greek. One of our latest writers, Mr. Hensleigh Wedgwood, whose *Dictionary of English Etymology* now in course of publication is most valuable, never attempts to go beyond the Gothic in his illustrations. The only English philologist, so far as my observation goes, who has drawn upon the Sanskrit for illustrations, is Mr. Oswald Cockayne, in his recent lively and interesting work entitled *Spoon and Sparrow*, and this only in a tentative and unsystematic manner. In Germany, in addition to the work of Professor Pott already alluded to, an elaborate volume was published at Vienna, in 1852, by Professor Holmboe, of Copenhagen, shewing the connexion of the Norse languages with the other Indo-European tongues,—illustrated by a large number of

Sanskrit examples.* With these exceptions the field is unoccupied, and will yield a fruitful harvest to the diligent investigator.

If we compare words in different languages, of the identity of which there can be no question, we find considerable differences in the forms which they assume, for instance—

English,	thief	German,	dieb
English,	door	German,	thür
English,	creep	Latin,	serp-o

Further examination has shewn that these transmutations are not arbitrary and capricious, but in all their varied forms exhibit the presence of *law*, often plain and simple, frequently subtle and delicate, and sometimes difficult and obscure. This is the great principle of modern philology, which has already produced great results, and promises still greater. By the discovery and application of these general laws, relations and affinities have been detected between languages formerly considered entire strangers to each other; converging lines have been traced, so to speak, pointing in the direction of the common centre of widely extended families of speech, and the chaotic Babel of human tongues has been reduced to something like order and system.

One of the most valuable discoveries was the fact that particular letters or sounds in certain languages are uniformly represented in certain other languages by other special letters or sounds. This is called Grimm's law of Phonetic Transmutation. For example we find the Sanskrit दशन् daśan represented by—

Greek,	τέκα
Latin,	decem
Gothic,	taihun
English,	ten
High German,	zehn—formerly zéhan

* "Det norske sprogs, væsentligste ordfører, med Sanskrit og andre sprog af Samme ÅEt." Wien, 1852.

It will be seen that the three first have *d* for their initial letter, the two second *t*, the last *z*. From various instances of this kind the Indo-European languages have been separated into classes ; the Sanskrit, Greek, and Latin, forming one group which may be called the classical ; the Gothic, the Norse tongues, and the Low German dialects, including the Anglo-Saxon, forming a second ; and the High German—now consisting of a single language, but formerly divided into various dialects, the Theotisc, the Alemannic, the Francic, &c.—forming a third.* This law of transmutation applies to consonants only, the vowel changes being accounted for differently. The consonants thus affected are classified as *Tenues*, *Medials* and *Aspirates*, thus—

	Labials.	Dentals.	Gutturals.
Tenues	P	T	K
Medials	B	D	G
Aspirates	F	TH	CH } Z H }

The relation of these letters to each other in the cognate languages, as classified above, stands as follows :—

Greek, Latin, Sanskrit.	Gothic and Low German.	Old High German.
Tenuis answers to	Aspirate answers to	Medial
Medial „	Tenuis „	Aspirate
Aspirate „	Medial „	Tenuis

The curious fact is here shewn that the Old High German stands to the Gothic in the same relation as the Gothic to the Classical ; where the Gothic substitutes an aspirate for the Greek tenuis, the High German substitutes an aspirate for the Gothic tenuis, and so with the other letters. This relation may be represented geometrically, in a triangular form, thus—



* The Celtic, Lithuanian, and Slavonic languages, equally belonging to the general Aryan stock, form no part of the present inquiry.

Starting from an angle and going round with the sun, the kindred letters always follow in the same order as indicated above. Or it may be illustrated thus—Any of the letters at any of the angles has always the same relative letter on the left and right. Thus, a tenuis has always a medial on the right, and an aspirate on the left. A medial has an aspirate on the right and a tenuis on the left. An aspirate has a tenuis on the right, and a medial on the left. These inter-relations are curious and interesting, but their origin and the regularity with which they occur are at present quite beyond the reach of our inquiries.

The table of permutations is as follows—

	Greek, Latin, Sanskrit.	Gothic and Low German.	Old High German.
Tenues	P	F	B or V
	T	TH	D
	K	H	G
Medials	B	P	F
	D	T	Z or TH
	G	K	CH
Aspirates	F	B	P
	TH	D	T
	CH	G	K
	H		

I have only space to give one or two illustrations of the operation of this law—

I.—INITIAL CHANGES.

Sans.	Lat.	Gr.	Gothic.	Old High Ger.	English.
twam	tu	<i>τυ</i>	thu	du	thou
bhri	fero	<i>φέρω</i>	baira	piru	bear

MIDDLE CHANGES.

upari	super	ufar	ubar	upon
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INITIAL AND MIDDLE.

kapāla caput *κεφαλή* haubith haupit head

Grimm's law, though exceedingly valuable, is liable to many limitations and exceptions, principally arising from the fact that most, if not all, of these cognate dialects had under-

gone further changes and corruptions previous to the date of the earliest specimens handed down to us. The most archaic forms of each language approach the nearest to the ascertained law.

In order to render intelligible the remarks which follow, I must now say a few words on the Sanskrit alphabet, probably the most scientific and elaborate phonetic arrangement which is found in any language. In a rapid sketch like the present, I must pass by the vowels and diphthongs, merely remarking that they consist of long and short *a*, long and short *i*, long and short *u*; *o* and *e*, the diphthongs *ai* and *au*; *ri* is treated as a vowel long and short, and the combination *lri* is also classed as a vowel, though only found in a single word.

The consonants are classified according to the organs employed in producing them, commencing at the throat and ending at the lips.

GUTTURALS.

Hard, surd or tenuis	क	k
Soft, sonant or medial	ग	g
Hard, aspirated	ख	kh
Soft, aspirated	घ	gh
Nasal	ঢ	nk ng
Simple aspirate	হ	h

PALATALS.

Hard	চ	ch
Soft	জ	j
Hard, aspirated	ঢ	chh
Soft, aspirated	ঝ	jh
Nasal	ঢ	nch nj
Sibilant	ঝ	sh

CEREBRALS.

Hard	ট	t
Soft	ঢ	d

Hard, aspirated	ठ	th
Soft, aspirated	ڏ	dh
Nasal	ળ	nt
Sibilant	ڦ	nd

DENTALS.

Hard	ਤ	t
Soft	ਦ	d
Hard, aspirated	ਥ	th
Soft, aspirated	ਧ	dh
Nasal	ਨ	nt
Sibilant	ਸ	nd

LABIALS.

Hard	ਪ	p
Soft	ਵ	b
Hard, aspirated	ਫ	ph
Soft, aspirated	ਭ	bh
Nasal	ਮ	m

SEMI-VOWELS.

ਯ y ਰ r ਲ l ਵ v

It will be seen that whilst the Sanskrit possesses many sounds which are lost in the cognate languages, others are deficient, such as the sound of *f*, and the dental aspirate represented by the English *th*. The palatals are not found in either Latin, Greek, Gothic or High German—that is in their early forms. They have been subsequently introduced into most of the modern European languages.

I now come to the consideration of the Sanskrit roots, the ultimate results of the closest analysis directed to the subject, and beyond which inquiry cannot go. They are, so to speak, the elementary atoms out of which the wonderful structure of the Aryan family of tongues has been built up. It would be too much to assert that all the radical forms of every

Aryan language are to be found in Sanskrit. A large number have doubtless been lost in Sanskrit, which form essential elements of other tongues, as many exist in Sanskrit which other tongues have not retained, but thus much may be asserted, that many Sanskrit roots are extensively diffused throughout every Aryan language, and that Sanskrit is the only language in which true roots have been preserved. This arises from the peculiarities of Sanskrit grammar, a large portion of which consists in the formation from the roots of crude forms or bases capable of inflexion.

A Sanskrit root is a primary monosyllabic sound "which conveys some simple idea appearing under different modifications in the derivatives from it."* Contrary to the theories of our older writers on language, these roots all convey abstract ideas, though of the simplest kind; for instance जीव् *jīv* conveys the idea of life or living, but it is neither a substantive, verb, nor any other part of speech, and cannot be employed as such until it has undergone certain modifications. To live is जीवित् *jīvitum*; life is जीवं *jīvan*. The prolific nature of these simple roots we shall see presently.

There are about two thousand roots in the Sanskrit language as it exists, but many of these are only secondary and derivative, though grammatically treated as roots. Bopp is of opinion that on close investigation they might probably be reduced to about five hundred.

The Sanskrit roots are of two classes; Verbal, from which spring verbs and nouns, and Pronominal, from which spring the pronouns, and all original prepositions, conjunctions and particles. The former class is by far the most numerous and prolific. From this class my illustrations will be chiefly derived.

The Verbal roots are divided into ten classes according to the mode in which the declinable base is prepared for in-

* Monier Williams' Sanskrit Grammar, 2nd edit., p. 39.

flexion. Two modes of conjugation are adopted, the Parasmai-pada, (words for another) used for active transitive verbs, and the Atmane-pada, (words for one-self or soul words) used principally in the sense of the middle and passive voices.

I have made these explanations as short and simple as possible; but some preliminary remarks were absolutely necessary to enable those who may not have turned their attention to the subject to understand what follows. I will now proceed with my illustrations.

One of the simplest abstract ideas is that of stability, expressed by the English word to *stand*. Radically this word is found in every Aryan language in an almost infinite variety of forms, the connexion between which previous to the study of Sanskrit, it was almost impossible to determine. They are all now traceable to the root स्था sthá (1st class Parasmai and Atmane) inflected in the present tense *tishtami*, *tishtasi*, *tish-tati*; Zend or old Persian *histami*. In Greek we have στάω, which has been abandoned for its derivative ἰστημι to stand; στοά, a place, a colonnade; στῆλὴ a column, στά-διος standing firm, &c. In Latin—*sto*, *sta-re*, *sta-tio*, *sta-tuo*, (to cause to stand, to appoint), *sta-tor* (one who appoints), *sta-tua* (a fixed image), *sta-tura*, *sta-tim*, *sta-tus*, *sta-bilis*, *sta-gnum*, *sta-bulum*, &c. In compounds—*si-sto*, *ob-sto*, *con-sto*, *re-sto*, *ex-sto*, *super-sto*, *inter-sto*, *con-sti-tuo*, *re-sti-tuo*, *sub-sti-tuo*.* Slavonic, *sto-ju* to stand; Hibernian, *sta-d* to stop; Gothic, *sta-nden*, with its compounds, *af-standan*, *at-standan*, *bi-standan*, *mith-standan*, *in-standan*, *us-standan*, &c., *sta-ths*, a place, *stains* a rock, a stone.

In Old German we have the crude form near akin to the root in *stan*, (Mod. Ger. *ste-hen*), from which proceed a very large number of derivatives, *gi-stan* (bestehen), *ana-stan* (anstehen), *ar-stan* (erstehen), *fora-stan* (verstehen), &c.,

* For the change of *a* into *i* in these compounds, see Bopp, Comp. Gr., § 6, and cxi.

with a large number of compounds ; *stiftan*, to appoint, place, with its compounds. *Sto-c*, the trunk of a tree, a beam ; *statt—stadt*, a place, a city. In Anglo-Saxon, *sta-ndan*, *sta-pol*, an appointed place, a prop ; *sta-thol*, a foundation ; *stæf, stōc, stow*, (a place) ; *sta-ith, ste-de*, &c.

The Low German dialects, the Old Saxon, the Old Frisian, the Dutch, and the Norse languages have all corresponding classes of words from the same root.

In English their name is legion, descended to us both from the Teutonic and Classic sources of our language—*sta-nd*, *sta-te*, *estate*, *sta-ndard*, *sta-tion*, *sta-tionary*, *ste-ad*, *ste-ad-y*, *sta-ple*, *sta-ble*, *sta-tue*, *sta-tute*, *sta-ture*, *sta-ted*, *sta-y*, *sta gnant*, *sta-unch*, *sta-ll*, *sta-ke*, *sta-ge*, *sta-ck*, *sta-ff*, *sta-ith*, *sto-ne*, &c. When we consider that these (and many more) are merely modifications of the primitive idea expressed by the root *sthá*, we may begin to appreciate the prolific nature of language ; its vast capability of extension and accommodation to the necessities of human thought, and the simplicity of its laws in its earliest development.

Our word to “*go*” expresses the simple idea of voluntary motion. It finds its root in the Sanskrit—गम् *gam*, Parasmai 1st class. Present *gachchhami*, Infin, *gantum*. The form in Zend is *Z'engiù*. Lithuanian *kan-ku*. Gothic *gan-gan*, with its compounds *at-gangan*, *mith-gangan*, &c., *gangs*—a street, gate, passage—

Old Saxon,	}	<i>gan-gan</i>
Anglo-Saxon,		
Old German,		
Old Low German,	<i>gan-ga</i>	
Old Frisian,	<i>gun-ga</i>	
Swedish,		^o <i>ga</i>
Danish,		<i>gaa</i>
Modern German,		<i>ge-hen</i>

Bopp is of opinion that to “*come*” is derived from the

same root, to which he refers the Latin *ven-io*, originally *guem-io*.

Gothic,	<i>quam, quiman</i>
Old German,	<i>quem-an</i>
Old Saxon,	<i>cum-an</i>
Anglo-Saxon, }	
Old Low German,	<i>kom-a</i>
Old Frisian,	<i>kum-a</i>
Holl.	<i>kom-en</i>
Swedish,	<i>kom-ma</i>
Danish,	<i>kom-me.</i>
Modern German,	<i>kom-men.</i>

In the Gothic language *quiman* and *gangan* are not unfrequently employed to express the same meaning as equivalents for the Greek $\epsilon\rho\chi\epsilon\sigma\vartheta\alpha\iota$; so Mat. 3, v. 11—"He that cometh after me is mightier than I." Gothic—"Sa afar mis *gangida* svinthoza mis ist." Mar. 1, v. 7—"There cometh one mightier than I after me." Gothic—"Qimith svinthoza mis sa afar mis." This tends to confirm Bopp's theory of their common origin.

There is a word much used by our old writers, *steyen*, or *steighen*, expressive of motion upwards, which has unaccountably disappeared from our language since the time of Chaucer and Wickliffe. Its root is found in the Sanskrit **स्थिग्** *stigh*; 5th class, *Parasmai*, *stighnomi*, *stighnosi*, *stighnoti*. Greek, $\sigma\tau\epsilon\chi\omega$, to go up.

The only trace of the root in Latin is *stega*, Greek, $\sigma\tau\epsilon\gamma\eta$, the deck or raised part of a ship.

Gothic, <i>steig-an</i> ,	to ascend, <i>steig-a</i> , a path
Old Low German,	
Old Frisian,	<i>stig-a</i>
Swedish,	
Danish,	<i>stig-e</i>
Holl.	<i>stij-gen</i>
Modern German,	<i>steig-en</i> , <i>steg</i> , a wooden bridge.

Anglo-Saxon, *stigan*, *stigh-el* (a stile), *stig-rap* (stirrup),
stæg-ers (stairs), *stig-e* (a ladder, still
 called provincially a "stee," or "steigh.")

" Sothely aftir thes dayes we made ready and *steygeden* to
 irlm."—Wickliffe. Acts of the Apos., ch. 21, v. 15.

" He *steigh* up to hevene
 And on his fader ryght hand
 Redelich he sitteth."

Piers Ploughman. Crede.

We have in the English language two classes of words descriptive of the relations arising from birth and race. One class is derived from Latin and Greek, such as *gentle*, *genealogy*, *genius*, *generate*, &c.; the other of native Teutonic origin, such as *kin*, *kind*, *kinsman*, &c. Both these classes find their origin in the Sanskrit root—

जन jan. Conjugated in the Parasmai form, 4th class,
 it signifies to produce, originate, beget.

Present. *jajanmi, jajansi, jajanti.*

Infinitive. *jajanitum.*

In the Átmane form, 3rd con., it means to be born.

Present. *jáye, or janye, jayishe, jayite.*

Infinitive. *jáytum.*

Greek, *γεν-ω, γίγρωμαι*, to be born, to be.

γεν-έα birth, *γέν-ος* race, *γεν-έσις* origin, beginning, &c.

Latin, *gen-o*, altered to *gign-o*, to beget; *gn-ascor*, to be born; *gen-s*, *gen-us*, *gen-itus*, &c. *In-gen-ium*, *in-gen-uus*, *pro-gen-itor*, &c.

The Sanskrit **जनक janaka** is equivalent to Latin *geni-tor*, father. **जनकी janako**, woman, corresponds with Greek *γυναικ* from *γυνακι*. **जन jana**, man, probably in the feminine **जना janā**, corresponds with

Greek, *γύνη*

Gothic, *qvino*

Theotisc, *qvino*

English, *quean*
queen

The English words derived from the Classical source are very numerous, and branch out into a great variety of meanings—*gen-ealogy*, *gen-eral*, *gen-erate*, *gen-it-al*, *gen-eric*, *gen-erous*, *gen-i-us*, *gen-ial*, *gen-tle*, *gen-teel*, *gen-tile*, *gen-uine*, *gen-us*, with their compounds.

The Teutonic stem gives us

Gothic,	<i>kuni</i> (race, kin).
Old German,	<i>kun-ni</i>
Old Saxon,	<i>cun-ni</i>
Old Low German,	<i>kyn</i>
Old Frisian,	<i>ken</i>
Hollandish,	<i>kun-ne</i>
Swedish,	<i>kön</i>
Danish,	<i>kjon</i>
Anglo-Saxon,	<i>cyn</i> , <i>cyn-ren</i>
English,	<i>kin</i> , <i>kindred</i> , <i>kinsfolk</i> , <i>kind</i> , <i>kinship</i> , <i>kindle</i> , (to bring forth.)

Our word *king*, Anglo-Saxon, *cyning*, has often been fancifully connected with *cun-ning* and *can-ning*, *i.e.*, the man that *kens*, or the man that *cans*, on the principle that “knowledge is power.” But there can be little doubt that the true etymology is from *cyn*, race, and *ing*, son or descendant, the man of birth, or of noble race, in the same manner that *ætheling*, “the son of the noble one,” was used as the title of the king’s heir.

The root ज्ञा *jná*, though quite distinct in Sanskrit from the last, has given rise to some confusion in the cognate languages, from the close resemblance of the derivatives. It signifies to “know,” and is conjugated in the Parasmai and Átmane forms, 9th class.

Present, *janami*, *janasi*, *janati*.

Greek, γνω·εω, γινώ·σκω

Latin,	<i>gno-sco, co-gno-sco</i>
Gothic,	<i>kunnan</i>
Old German,	<i>kunnan</i>
Swedish,	<i>känna, kunna</i>
Danish,	<i>kjènde, kunne</i>
Hollandish,	<i>kennen</i>
Mod. German	<i>kennen, könen</i>
Anglo-Saxon,	<i>cnawan, kunnan</i>

There can be no doubt that our auxiliary *can*, like the German *können*, is an adaptation of the primary meaning, knowledge, implying ability. Chaucer uses *can* in the sense of knowing, *conne* in the sense both of knowledge and ability.

“ I wot wel Abraham was an holy man,
And Jacob eke, for as ever I *can*.”

Wife of Bath's Tale.

“ Then said Melibee : I shall not *conne* nswere unto so many faire
resons as ye putten to me.”

Tale of Melibœus.

The double derivation of which I have spoken, is found in many classes of English words with changes of meaning more or less important. The terms *mortal*, *immortal*, &c., referring simply to decease, are derived from Sanskrit through Greek and Latin. The word *murder*, implying a violent death, is derived from the same root by a Teutonic descent.

मृ *mri* or *mar*, to die ; Causative to kill, to slay.

6th Con. Átmane.

Present *mriye, mriyase, mriyate*

मृत *mrīta*, mortal

Latin, *mor-i*, to die ; *mor-s*, death ; *morbus*, disease ;
 im-mor-talis, deathless.

Greek, *μόρος*, death, fate ; *ἀ-μροτός* for *ἀ-μροτός*, im-
mortal.

Lithuanian, *mir-ti*, to die

Russian, *s-mer-ti*, death

From this primitive meaning of the root our words *mortal*, *immortal*, &c., are derived.

From the Causative sense, to kill, slay, descend—

Gothic,	<i>maur-thr</i> , murder
German,	<i>mord</i> , <i>morden</i>
Anglo-Saxon,	<i>morth</i> , <i>mor-thor</i> , &c.
Swedish,	<i>mord</i>
Danish,	
Hibernian,	<i>mar-bhaim</i> , I kill ; <i>mar-bhan</i> , a corpse.

The recent progress of a sound system of philology and the light derived from the study of Sanskrit are well shewn by reference to the speculations on these words. Horne Tooke* derives *murder*, *morrow*, and *mirth*, from the same original, which he says is found in the Gothic and Anglo-Saxon verb *merjan*, *merran*, which means to scatter, to dissipate. *Mirth* is the third person singular of the verb, and signifies that which dissipateth care and sorrow. *Morrow* and *Morning* are the past tense and past participle, and signify the dissipation of clouds and darkness. The Anglo-Saxon *Morthe* is that which dissipates life, and hence is derived French *Meurtre* and Latin *Mors*.

The speculation is ingenious, but will not bear examination. To say nothing of the odd notion of a Latin radical being derived from an Anglo-Saxon inflexion, it may suffice to remark that the Gothic *merjan* has in no case the meaning of “to scatter, dissipate.” Its uniform signification is “to declare, announce, preach,” and is the equivalent of Greek *κηρύσσειν*, *διαλαλεῖν*, *εὐαγγελιζεσθαι* ; “*merjands daupein idreigos*,” “preaching the baptism of repentance.”

Dr. Richardson adopts Horne Tooke’s etymology, with a slight difference, suggesting that the Gothic verb *maurthrjan* was probably formed from the third person singular of Anglo-

* *Diversions of Parley*. Taylor’s Edition, 1857, pp. 461, 614.

Saxon *myrran* to mar, and the English noun and verb from this.

We are not here concerned with the etymology of *Mirth* and *Morrow*; whatever may be their derivation, the direct connexion of Latin *mors*, Gothic *maurthr*, English *murder*, with the Sanskrit root *mri*, is clear and distinct. When such hap-hazard guesses as these are put forth as serious inferences by our highest authorities, it is manifest that the whole system of our English etymology requires revision.

Many of the Sanskrit roots, in the vital energy which they display in accommodating themselves to the progressive necessities of human thought, have put forth derivatives widely extending the application of the original idea, but in most cases the connexion is capable of being traced, and possesses considerable interest, from the light it throws on the progress of the human race. I will give a few instances of this kind—

दम *dam*, 4th class Parasmai

Present *damyami*, *damyasi*, *damyati*

Infinite *damitum*

The primitive idea in this root, which we shall find more or less involved in all its derivations, is that of arranging, setting in order. In the causative form applied to inanimate objects, it means to put together, to construct (*ligare*, *struere*); applied to living beings it means to tame, to subdue. In the neuter it has the sense of fitting, becoming. **दमन** *damana* means a tamer, equivalent to the Greek *δαμ-ος*, *ιππόδαμος* a horse-tamer. In this sense we have—

Greek, *δαμ-άω*, *δαμ-αζω*
 Latin, *dom-o*

In Gothic, according to Grimm's law, the medial "d" is changed into the tenuis "t" and it becomes *tam-jan*, Anglo-Saxon *tam-ian*, English *tame*. In High German the tenuis "t" is further exchanged by Grimm's law for the aspirate

“z” equivalent to “th,” and it becomes *zähm-en*, to tame, whence *zaum*, a bridle.

The Swedish, Danish, and Hollandish, follow the Gothic in the word *tam*.

The primary meaning of the root, that of order and arrangement, is shewn in the word *दम dama*, which means soothing the mind after perturbation. This is further carried out by applying it to the family connexion, *दम्पती dampatī*, signifying a married pair, wife and husband.

The same application is made in Greek, where *δαμ-αρ* means “a wife or spouse,” whilst a maiden was called *ἀ-δαμ-άστρος*, one untamed or unyoked.

In Latin this sense is widely applied. *Dom-us*, originally means the home, the family, rather than the building in which they dwell. *Dom-inus* and *dom-ina* are the master and mistress of the household, whence a large class of secondary forms, *dom-icilium*, *dom-inor*, *dom-esticus*, *dom-inium*, (a feast in the house), &c. The derivatives from this source are very numerous in the Romance languages, *dam-a*, *donna*, *don*, *dame*, *ma-dame*, *ma-dem-oiselle*, *dim-anche*, (*from dom-inica*), &c.

In English also this branch from the root has been very prolific. We have *dame*, *dom-e*, *dom-estic*, *dom-ain*, *dom-inate*, *dom-iner*, *dom-icile*, *dom-inical*, &c., principally through the French, this application of the root not having obtained currency in the Teutonic languages.

In the sense of being fitting or becoming, we have Gothic *tim-an.** Luke v, 36—“The piece out of the new agreeth not with the old.”

Gothic—“thamma fairnjin ni *ga-tim-id* thata af thamma niujjin”—

* For the law of change from the Sanskrit “a” to the Gothic “i,” see Bopp, *Comp. Gram.*, I, p. 56.

Old German,	<i>zim-en</i>
Modern German,	<i>ziém-en</i>
Anglo-Saxon,	<i>sem-an</i>
English,	<i>seem, be-seem</i>

As applied to inanimate things in the sense of construction we have—

Greek,	$\delta\epsilon\mu\text{-}\omega$, to build, construct
	$\delta\epsilon\mu\text{-}\alpha\varsigma$, the human frame
	$\delta\delta\mu\text{-}\alpha\varsigma$, } a building
	$\delta\omega\mu\text{-}\alpha$,

According to Grimm's law, the *dem* of the Greek becomes *zim* in High German, and *tim* in the Gothic dialects. Our word *timber* is usually supposed to apply exclusively to wood, and is traced by Pictet* to Sanskrit, दम्भ *dambh*, to burn. This derivation, however, is not borne out on full inquiry.

In the Old Teutonic dialects—

Old German,	<i>zim-bar</i>
Gothic,	<i>tim-r</i>
Norse,	<i>tim-mer</i>

signified both a room or building, and the material, whatever it might be, of which it was constructed, and is used more frequently to describe stone than wooden construction. Wachter† gives the meaning "Materia unde aliquid fit." Junius‡ remarks, "Constat materiam tam ligneam quam lapideam unde aliquid efficitur, *timber* appellari, immo metalla alemannicē *zimbar* vocari."

In the Old Norse, we read, "Slahans dör up eller hans *tymber* sönnar." "If they should burst the door, or break open the room."—*Stadga om Urbatomal*.

In the Gothic New Test, Ephes. ii, 20-2.—"Built upon the foundation of the apostles and prophets, Jesus Christ himself being the chief corner *stone*; in whom all the *building* fitly

* *Orig. Indo-Europ.*, I, p. 211.

† *Gloss. Ger. sub voc.*

‡ *Gloss. Ulph.*

framed together groweth unto an holy temple in the Lord ; in whom ye also are *buildest* together for an habitation of God through the Spirit." Gothic—" *Ana-timridai* ana grunduvaddjau apaustaule jah profete at visandin auhumistin vahstastaina silbin **X**ristau iesu ; in thamma alla *gatimirjo* gagatiloda vahseith du alh veihai in frauojin ; in thamma jah jus *mithgatimiridai* sijuth du bauanai Guths in ahmin."

It is remarkable that the word *timr* is never employed in the Gothic language in the sense of wood. *Bagm* beam, *ans* beam, and *triu* tree, are uniformly employed.

In Anglo-Saxon, *timbrian*, *getimbrian*, to build, *getimbrung*, a building, are equally used to describe stone constructions. Mark xiii, 1—" Master, see what manner of *stones*, and what *buildings* are here." " Lareow ! loca hwylce *stanas* her synd and hwylce *getimbrunga* thyses temples ! "

As the German and English forests furnished the readiest material for ordinary building, the term *timber* naturally became mainly associated with wood, until it gained its present exclusive use. In the same way the French word *plancher*, which simply means the floor, became in English the word *plank* applied to the wooden boards of which a floor is with us usually constructed. The German term *zimmer-holz*, wood applicable for building, preserves a reminiscence of the original meaning of the word.

मा *má*, to measure, to parcel out

3rd Con. **ĀTMANE**.

Present *mime*, *mimishe*, *mimita*

2nd Pret. *mame*

Employed also in the sense of giving out—

इषे नो मिमीतम् *ishe no mimitam*, give us food.

Rigveda.

We have here, as in so many other cases, words in English descended from the same root by both lines of parentage.

Greek, *μέτρον*, a measure or rule, with its numerous derivatives
μετεμβαίνειν, to take the measure of, to imitate
α-μετρος, unmeasured
μέσος, middle
μήν, the moon, the measurer

Latin, *me-to*, *me-tior*, to measure
im-ma-nis, huge, unmeasured
me-nsura, measure
me-dius, middle
me-nsa, month
mo-dus, a measure
mo-dero, to keep within measure
 hence *modestus*, &c.
me-ditor, originally to act or speak in a measured way,
 to exercise.

From this source, both direct and through the French, we have a large number of words; *measure*, with its various compounds and derivatives; *mediate*, *medium*, *immediate*, &c., *meditate*, *modest*, *moderate*, *modulate*, &c.

In the Teutonic division we have—

Gothic, *mi-tan*, to measure
mi-taths, measure
ma-itan, to cut, divide
me-na, the moon
me-nath, month
mid-ja, middle

Old High German, *me-zan*, to measure
ma-no, moon
ma-noth, month

Old Low German, *me-ta*, *mani*, *manadi*

The Norse languages correspond.

Anglo-Saxon, *me-tan* *mo-na*, *mo-nath*, *mid-de*, middle
 English, to *mete*, *moon*, *month*, *middle*, *mean*, *meet*.

Our word *meat* for food appears to be derived from the same source. On this word Horne Tooke observes, “In

Anglo-Saxon *mæt* (whatever is eaten) is the past participle of the Gothic verb *matjan*; Anglo-Saxon, *metian*, edere, to eat. Dr. Richardson quotes Tooke and as usual adopts his etymology. The Gothic verb *matjan*, from the strict nature of Gothic grammar, is itself derived from *mat*, meat, and cannot have given rise to it. The Anglo-Saxon verb *metian*, *metsian*, which has its congeners in the sister languages, never signifies to eat, but uniformly "to deal out," to give to eat.* The words Anglo-Saxon *mete*, Gothic *mat*, &c., are really the participles of the verbs *metan*, *mitan*, and signify not food in general, but that which is *meted* or dealt out at table. The same thing occurs in Sanskrit where मांस *mánsa*, from the same root, signifies caro, flesh.

There is every reason to believe that our word *mother* is derived from the same root. मातृ *mátri*, mother (*matar* in inflexion), is a noun of agency, formed according to the rules of Sanskrit grammar from the root मा *má*, and signifies a dispenser, dealer out. From thence it has descended into every branch of the Aryan family

Greek,	μητηρ
Latin,	<i>mater</i>
German,	<i>mutter</i>
Anglo-Saxon,	<i>meder</i> , <i>moder</i>
Swedish,	<i>moder</i>
Hollandish,	<i>moeder</i>

The Gothic being the only Teutonic language in which it is wanting, its place being supplied by the term *aithei*.

It may be remarked that this mode of forming the noun of agency by the addition of *ri* or *ar* to a form of the verb is identical with the mode still adopted in our own tongue; and which enables us, quite legitimately, to form new words from any verb which may be introduced into the language.

* *Sax. Chron.*, 1013. "Tha bead he that man sceolde his here, *metian*, and horsjan." Then commanded he that his army should be fed, man and horse.

Ps. lxxx, 6. "Thu *metsast* us." Thou givest us food.

Almost every verb is capable of forming substantives in this manner. Help, help-er, think, think-er, run, run-ner, &c. So from the verb *mete*, in the sense of dealing out, the noun *met-er* is exactly equivalent to our word *mother*, which bears the same original meaning in a more antiquated form.

The other nouns of relationship are formed in the same way. Father, daughter, sister, brother, are all Sanskrit nouns of agency, formed upon verbal roots. Father is from पितृ *pitri*, corrupted from पत्र *patri* or *patar*, according to Bopp, which is derived from पत् *pat*, to defend, sustain.

Zend,	<i>patarē</i>
Greek,	<i>πατήρ</i>
Latin,	<i>pater</i>

By Grimm's law, the initial tenuis changes in the German dialects to the aspirate.

Gothic,	<i>fadar</i>
Old German,	<i>fatar</i>
Modern German,	<i>vater</i>
Swedish,	<i>fader</i>
Danish,	
Old Frisian,	<i>feder</i>
Anglo-Saxon,	<i>fadar</i>
Hollandish,	<i>vader</i> .

Daughter is, in Sanskrit, दुहितृ *duhitri*, or *duhitar*, derived from दुहृ *duh*, *mulgere*, extrahere, and signifies literally milker or milkmaid. All the primary names of the family relations are derived from the office each sustained in the primitive household, and in a pastoral state of society the duty of milking naturally devolves on the young maidens of the family. This derivation has been doubted. Mr. Cockayne * says—"This appears to me very doubtful. In general in ancient times men milked: cattle that roam over unlimited pastures are very wild, and it was never convenient to send

* *Spoon and Sparrow*, pp. 118, 331.

the maidens far from home. The word, also, is correlative, the maiden is not daughter either to the cow or to the family.” This seems hypercriticism. Whatever construction we may put upon the fact, there can be no question either as to the derivation of *duhitar* from *duh*, nor of the affiliation of the term in most of the Aryan languages. A parallel case occurs in another family relation, the derivation of which is within our own tongue. *Wife*, originally *wif-man*, meant, as is well known, the *weaver*, in contradistinction from the husband, who was the *wæpn-man* or soldier, but although weaver to the family, the term became restricted in course of time to her conjugal relation, from the fact of the wife, in our sense of the term, being always, or usually employed in preparing the garments for the family. So, the daughters in our sense of the term, being the ordinary milk-maids, the *duhitar* became inseparably associated with the filial relation.

Greek, *θυγάτηρ*

The Greek aspirate, by Grimm's law, becomes

Gothic,	<i>dauhtar</i>
Old Low German,	<i>dottu</i>
Swedish,	<i>dotter</i>
Danish,	<i>datter</i>
Anglo-Saxon,	<i>dohter</i>

The medial changes to the tenuis in the High German—

Old German, *tohtar*

Modern German, *tochter*

“ Brother,” Sanskrit भातृ *bhrātri*, or *bhratār*, appears to be derived from भृ *bhri*, and signifies bearer or helper, an expressive term, as applied to the fraternal relation.

The Sanskrit “bh” is usually expressed by the Greek *φ*, and Latin *f.*

Greek, *φρατήρ*

Latin, *frater*

The classic aspirate changes to the Gothic medial—

Gothic,	<i>brothar</i>
Old Low German,	<i>brodar</i>
Swedish,	<i>broder</i>
Danish,	
Anglo-Saxon,	<i>brothor</i>

In High German the medial is exchanged for the tenuis. Old High German *pruodar*, softened in Modern German to *bruder*. "Sister" is represented in Sanskrit by "swasri" or "swasar." The primary meaning is somewhat obscure.

स्वादु	<i>swádu</i> , signifies pleasant, agreeable
Gothic,	<i>sutis</i>
Latin,	<i>suavis</i>
English,	<i>sweet</i>

According to this the sister would stand to the brother in the relation of soother, consoler. Let us hope that this is a more probable derivation than the one suggested by Bopp, from स्वा *swa* "suus," and सार् *sar* "femina," which has reference solely to the intimate family relation of the parties.

Latin,	<i>soror</i>
Gothic,	<i>svistar</i>
Old German,	<i>suestar</i>
Old Frisian,	<i>svestar</i>
Swedish,	<i>syster</i>
Danish,	<i>söster</i>
Hollandish,	<i>suster</i>
Anglo-Saxon,	<i>svuster</i>
Modern German,	<i>schwester</i>

Two of the roots already alluded to in these family relations have other English derivatives. From दुह् *duh*, to draw out, to pull, to milk, comes—

Gothic,	<i>tiuh-an</i>
Old Saxon,	<i>tioh-an</i>
Old Frisian,	<i>tog-a</i>
Old Low German,	
Anglo-Saxon,	<i>teon</i>
English,	<i>tug</i> , also <i>dug</i> , (for a teat)

The High German substitutes the aspirate for the tenuis and it becomes *zieh-en*, anciently *ziuh-an*, to draw or pull.

From the same root comes the Latin *duc-o*, the primary meaning of which is to draw.

“ Quo sequar, quo *ducis* nunc me ? ”

Plau. Bac., 3. 3. 2.

So the derivatives *ductilis*, *ducto*, *ductarius*, &c., all refer to drawing rather than leading, which is the secondary meaning.

We have in English many words through this channel ; *duct*, *ductile*, *ductility*, *conduct*, *con-duce*, *re-duce*, &c.

The root **भ** *bhri* or *bhar*, from which *brother* is derived, has many other derivatives both in our own and the kindred languages.

Greek,	<i>φέρω</i> , <i>φορέω</i> , <i>φόρος</i>
Latin,	<i>fer-o</i> , <i>fer-re</i> , to bear
	<i>for-tis</i> , that which will bear, strong
	<i>fer-tilis</i> , } bearing fruit
	<i>fer-ax</i> , } bearing fruit

Our derivatives from this classic source are not numerous, but we have *fertile*, *fertility*, *fertilize*, &c. According to the law so often quoted the radical becomes in Gothic *bair-an*, with a large number of compounds and secondary forms.

Old Saxon,	<i>ber-an</i> , <i>giberan</i>
Anglo-Saxon,	<i>ber-an</i>
Swedish,	<i>bär-a</i>
Danish,	<i>bær-e</i>

In the Old German, following the law, it is *per-an*, now softened down to *gebähren*. In all the languages it is also employed in the sense of bearing fruit, and bearing children. From the same source comes *burden*, that which is borne. As a secondary meaning it takes the sense of raising up, elevating ; hence “ *berg* ” a hill, mountain ; Anglo-Saxon, *byrian*, originally to raise up, from which our word to *bury*, now meaning to put in the ground, but originally to raise a

mound or *barrow* over the deceased. A further meaning is that of protection connected with elevation; Anglo-Saxon—*beorgan*, to protect, fortify; whence *byrg*, *burg*, *borough*, a city, the early cities being usually placed on elevated sites for protection—

The Gothic,	<i>bringan, braht</i>
German,	<i>bringen</i>
Anglo-Saxon,	<i>bringan</i>

are also derived from the same root in the sense of carrying.

¶ *dhru*, to stand firm

6th class Parasmai *dhruvami, dhruvasi, dhruvati*

From this idea of standing firm comes the Greek $\delta\rho\nu\varsigma$, oak tree; Cambri *dri*, oak, hence the term *dru-id* for the Celtic priests whose worship was connected with groves.

Gothic,	<i>triu</i> , tree
Old Low German,	<i>tre</i>
Swedish,	<i>trä</i>
Danish,	<i>træ</i>
Hollandish,	<i>tere</i>
Anglo-Saxon,	<i>treon</i>
English,	<i>tree</i>
Old English,	<i>treen</i> , made of wood <i>trivet</i> , a wooden bolt, now contracted to "rivet"

In this sense the term does not exist in the High German branch.

In the secondary sense of sure, certain, fixed, true, it has a wider range—

Sanskrit,	ध्रुव <i>dhruva</i> , certain, sure
Lithuanian,	<i>drú-tas</i> , firm
Gothic,	<i>trau-an</i> , to trust <i>trau-ains</i> , confidence
Old High German,	<i>truen</i>
Modern German,	<i>trau-en</i> , to trust <i>treu</i> , faithful <i>trösten</i> , to comfort, &c.

Old Low German,	<i>tru-a</i>
Old Frisian,	<i>triu-we, trow-a</i>
Swedish,	<i>tro</i> , faithful
	<i>trost</i> , bold
	<i>trosta</i> , to dare
Danish,	<i>troe</i>
Hollandish,	<i>troww</i>
Anglo-Saxon,	<i>treow-ian</i> , to trust, confide
	<i>treow-fæst</i> , faithful
	<i>treowth</i> , truth
	<i>truw-a</i> , a treaty

In English, we have from the root in this sense, *truth*, *true*, *trow*, *troth*, *truism*, &c., *truce*, *trust*, *tryst*, *trusty*, *trustee*, and their compounds.

Perhaps the wonderful fertility of a single root cannot be better exhibited than in one with which I shall conclude.

लुभ *lubh*, to desire, covet, allure.

4th class Parasmai *lubhyami*, *lubhyasi*, *lubhyati*.

The Greek possesses no remains of this root.

In Latin we have—

lubens, willingly, with pleasure.

lub-et, or *libet*, to be disposed.

lub-itum, or *libitum*, at pleasure.

lub-ido, or *libido*, desire, lust.

Lith. *lūb-ju*, to desire.

Slav. *liúb-iti*, to love.

The Teutonic tongues are the most prolific.

Gothic, *liub-an*, to love

liub-s, dear.

Old Low German, *liuf-r*

Old Saxon, *lioſ*, *lief*, *gi-lōb-ian*

Old Frisian, *liaf*

Hollandish, *liev-en*, *lief*.

Old High German, *liub-an*, *lieb-en*

Modern German,	<i>lieb-en, lieb-e</i>
Swedish,	<i>ljuf, lyuf-lig</i>
Icelandic,	<i>liuf-r</i>
Anglo-Saxon,	<i>lufan, leof-lic</i>

In English we have *love*, *lover*, *lovely*, *loveless*, *loveliness*, with various compounds. So far extends the primary meaning.

There is another group of words, the connection of which with this root is not so obvious, but of which the examination will reward research.

The derivation of the English word *believe* has hitherto been an unsettled question with etymologists. Its equivalents in the cognate dialects are as follow—

Gothic,	<i>laubjan, galaubjan</i>
Old High German,	<i>laubjan</i>
Modern German,	<i>glauben, er-lauben</i>
Danish,	<i>lov, love</i>
Hollandish,	<i>ge-loov-en</i>
Old Low German,	<i>leyf-a</i>
Anglo-Saxon,	<i>lyf-an, ge-lyfan</i>

Johnson simply refers the word to the Anglo-Saxon *gelyfan*, which is perfectly correct so far as it goes. Richardson enters into a much more elaborate inquiry. He says—"The etymologists do not attempt to account for this important word. It is undoubtedly formed from the Dutch *leven*, German *leben*, Anglo-Saxon *lifian*, *be-lifian*, Gothic *liban*, 'vivere,' to live or be-live, to dwell. *Live* or *leve* are used indifferently by old writers, whether to denote *vivere* or *credere*." Amongst others he gives the following examples from *Robert of Gloucester*—

"He *bi-leude* without the town, and in *wel grete fere*."

Here *bi-leue* is to *live*, or continue to *live*, to dwell.

In the following

* * " *hys soule for to amende*

*That rygt *bi-leue* hym tagte and gef him Cristendom,"*

the meaning is, taught him to *live* rightly ; taught him a rule by which to *by-leve* or to *live* ; and gave him Christendom or Christianity—made known to him the life of Christ, how he *be-leved* or *lived*—as told in the gospels of Christ.

In the following, from *Piers Ploughman's Vision*—

“ Werfore he het the elemens, to helf you, alle tymes
And bring forth youre *bylive*, bothe lynnен and wollen.”

“ To bring forth your *bylive*,” is to bring forth that by which you may *live*.

To *believe*, then, is—to *live* by, or according to, to abide by ; to guide, conduct, regulate, govern or direct the *life* by ; to take, accept, assume, or adopt as rule of *life* ; and, consequently—to think, deem, or judge right ; to be firmly persuaded of, to give credit to ; to trust, or think trustworthy ; to have or give faith or confidence ; to confide, to think or deem faithful.” So far Dr. Richardson.

I have made this extract at some length for the purpose of exhibiting the present condition of the science of English etymology ; and the utter absence of sound principle in pursuing the inquiry. Where a word actually exists in Anglo-Saxon (which is only another name for the older form of our own tongue), the natural and obvious course would be to carry back the analysis as far as possible by comparison with cognate languages until a common root be reached from which the various forms have diverged, instead of which we find fanciful conjectures as to the origin, in a later age, of a word co-eval with the existence of the language itself.

The analogies relied on by Dr. Richardson are without foundation. The remark that “ *live* or *leve*, *be* or *bi-leve*, are used indifferently by old writers, whether to denote *vivere* or *credere*” is not borne out by the examples given.

In the first passage given above, from Robert of Gloucester, “ *He bi-leude* without the town, &c.,” the word *bi-leude* is an inflexion of the Anglo-Saxon *belisan*, “ to remain,” and

means, "he remained or stayed" outside the town, &c. Two other quotations given from the same author, present the same word with the same meaning.

The Scottish dialect still preserves a reminiscence of this verb—

"Belyve the elder bairns come drapping in."

Cotter's Saturday Night.

Chaucer uses the word in the same sense. In the "Story of Cambuscan bold," Canace, recounting her sorrows, says—

" Swiche harme I felt, for he ne might *by-leve*,
So on a day, of me he took his leve."

A similar instance occurs in "Troilus and Creseide," Book III, 624.

The corresponding term is found in the Gothic of the 4th century. 1st *Thessalonians*, iv, 15—

" We who are alive and *remain*."

" Veis thai libandans jah *bilaibidans*."

Also in Francic of the 9th Century—

" Balo ther uns klibit
Joh leidor nu *bilbit*."
The evil (bale) cleaves to us,
And the pain now *remains*.

Otfrid. Evang., Lib. II, ch. vi, 72.

In the quotation from *Piers Ploughman*, the word *bilyve* means sustenance, food and clothing, as in the following passages not quoted by Richardson—

" And some he kennede craft and konnynge of sight,
With sellynge and buggynge, hir *bilyve* to wynne."

Vision v, 13425.

" That thou toke to thi *bilyve*, to clothes and to sustenaunce."

Vision 13939.

The word is from *bi-libban*, to live by, but has not the remotest connexion with *belief*.

In the second passage from Robert of Gloucester—

" That rygt *bi-leue* him tagte, &c."

and in the remainder of the quotations the word is simply the modern *belief* disguised under the antique spelling.

The irregularity and uncertainty of mediæval orthography, frequently confounded words quite distinct in their origin and meaning. This was not that the same word was intended to be employed in different senses, but that words radically distinct, in the absence of any orthographical system, were frequently expressed by the same letters. In *Piers Ploughman's Vision*, the words *leven* to leave, *leven* to dwell, remain, and *leven* to believe, are all spelled alike, but that they are really different words, and not mere accommodations of the same expression, is evident from the fact of the preterite of the first being *laſte*,* of the second *leſte*,† and of the third *leved*, *leveden*.‡

If Dr. Richardson were correct in his deviation of *believe*, *belief*, from *by* and *life* or *live*, i.e., that which we live by or the *by-life*, it must have originated since the use of modern English, as no such compound exists in Anglo-Saxon, whilst the actual word itself *ge-leafa*, *ge-leafan*, sometimes spelt *ge-lefa*, *ge-lyfan*, was in common use. The difference in the prefix between the Anglo-Saxon *ge-leafa* and the modern *be-lief* is unimportant. The same change has taken place with many other words; *bethink*, Anglo-Saxon *gethencan*; *betoken*, Anglo-Saxon *getæcan*; *besmear*, Anglo-Saxon *gesmieran*; *besprinkle*, Anglo-Saxon *gesprengan*.

It may be remarked that the English words *belief*, *believe*, and their foreign congeners are purely Teutonic, no cognate terms being met with in any of the other branches of the Aryan family.

* "For confort of his confessour contricion he *laſte*."

Vision 14666.

† "There is more pryvē pryde
In Prechoures heretes,
Than there *leſte* in Lucifere."

Creed 743.

‡ "Tho that me lovede
And *leved* in my comynge."

Vision 12890.

Wachter derives the German form *glauben* from *lauben*, which he says, “Proprie est manu apprehendere, a *law*,* manus, et simile Attico λαβεῖν. Dicitur autem allegorice de fiducia, quia manus ab antiquo fidei datae et acceptae symbolum fuit.”

It is sufficient to remark on this etymology that the oldest form of the German is *laubjan*, a derivative from another verb, and that the forms in the cognate languages of equal antiquity with the German, give no indications of the derivation to which he alludes.

Skinner derives the Anglo-Saxon word *geleafan* from the particle *ge*, and *lyfan*, to grant, allow, “concedere.”

The origin and history of these terms may be briefly stated as follows. In the Gothic language, which is peculiarly valuable from its shewing changes in progress which are only found in their completed results in the sister tongues, the verb *liuban*, to love, makes its preterite *lauf*, *lubun*. From this, by adding the suffix *jan*, a secondary verb *laubjan*, with the usual intensive prefix, *ga-laubjan* is formed. This extends the original meaning of preference, desire, to that of trust, reliance, and then, of faith, belief. Thus in Luke xvi, 11, “Who will *commit to your trust* the true riches?” the Gothic version expresses it “thata sunjeino was izvis *galau-beith*?” Romans x, 11, “Whosoever *believeth* on him shall not be ashamed.” Gothic, “wazuh sa *galaubjands* du imma ni gaaiviskoda.” In this the Gothic follows exactly the πιστεύω of the original Greek, which similarly combines the two shades of meaning.

The Gothic *galaubjan* became contracted into the German *glauben*, and the parallel forms quoted above are merely dialectic variations. The double sense of trust and belief is well shewn in the following passage from the Anglo-Saxon version of the Gospels. Matthew ix, 2, “And Jesus seeing their

* Scottish “*loof*.”

faith, said unto the sick of the palsy, Son, be of good cheer, (Greek $\theta\alpha\rho\sigma\epsilon\iota$, Latin *confide*) thy sins be forgiven thee." Anglo-Saxon, "Tha geseah se Hœland heora *geleafan*, and cwœth to tham laman, Sa bearn *gelyfe*, the beoth thine synna forgyfene."

This derivation of *belief* from *love* is admitted by several recent etymologists of high authority. Gabelentz and Loebe and Diefenbach, place the words according to this derivation. Junius connects the English *believe* with Gothic *galaubjan*, but pursues the analysis no further.

It is difficult to resist the feeling of a close etymological connexion between the words *live* and *love*, German *leben* and *lieben*, Gothic *liuban* and *liban*, Anglo-Saxon *lybban* or *leofian*, and *lufian*. This resemblance runs through all the Teutonic languages. These forms with the exception of a few words in Latin are not found in the other branches of the family.

This connexion was not unperceived by our older philologists. Junius on the word *live* observes, "plures petierunt ex *lieben* amare, diligere, quod miseris mortalibus nihil vitâ carius." Should this speculation prove correct, that *live*, *love*, and *believe*, are derived from the same original, it gives a remarkable illustration of the simplicity of the ancient roots, and of their vital power in expanding and giving bodily form to the ever widening demands of the human mind.

I must here bring these remarks to a close. I have brought under notice a mere fragment of a wide field which lies open for exploration, and in which patient study will produce results of a very important nature as regards English etymology. When the study of the Sanskrit roots shall have been thoroughly and systematically worked out, the philology of the Aryan tongues in general will assume a character of accuracy and science which it has never yet attained.

In our own tongue this is peculiarly important. The Eng-

lish language, in one respect, may be said to be unique. We have seen that there are two divergent channels along which derivatives from the original roots have descended to modern times. I have called these the Classical and the Teutonic. Some roots have followed the one course and others the other; many have been transmitted to us through both. The mixed character of modern English speech has been sometimes represented as a defect, but there was never a greater mistake. The two streams, descending from long remote ages, have united on English ground, and nowhere else, and have imparted to our tongue a strength and vigour, combined with a richness and fertility, which have never been surpassed in the world's history, and which render it unrivalled amongst modern languages as a vehicle for thought. I shall be glad if any remarks of mine may have given an impulse, however feeble, to an inquiry of the most interesting character, and which will well repay research.

At the conclusion of this paper a vote of thanks was proposed by Mr. Birch and seconded by Mr. Danson, (who referred to the valuable Sanskrit collection in the Free Public Library, the credit of which was due to Mr. Picton,) and carried unanimously. Dr. Ginsburg made some supplementary remarks upon the analogy of some of the roots mentioned by Mr. Picton and those of oriental tongues.

FIFTH ORDINARY MEETING,

ROYAL INSTITUTION, December 14th, 1863,

JAMES A. PICTON, Esq., PRESIDENT, in the Chair.

Messrs. R. D. Holt, Robert Erskine, Rudolph Zwilchenbart, junr., and Theophilus Ashe, were balloted for, and duly elected members.

It was announced that Mr. S. H. Behrend, M.A., had accepted the post of Librarian, and he was requested to prepare a catalogue of the books in the library as soon as possible.

The PRESIDENT stated that, thinking it would be interesting to the society, and through the society to the public at large, to have brought before them objects of interest acquired from time to time by purchase or donation for the Free Public and Derby Museum, he had laid such a proposal before the Committee, who gave it their cordial approval. Mr. Moore had, in consequence, brought, as an instalment, some remains of the great fossil cave-bear (*Ursus spelæus*). Of this gigantic extinct beast the skull and under jaws, the greater part of the vertebræ and of the bones of the limbs, as well as ribs and phalanges, had lately been obtained by purchase, from Arriège, in the south of France, forming a most important addition to the Palæontological collection, on account of the great interest attaching to it in connexion with the question of the antiquity of man. Mr. Moore also exhibited some nests of weaver birds, (*Ploceus baya*?) from Burmah, recently presented, with other specimens, by Captain Major, of the ship Norway.

A specimen of *Comatula*, and a series of *Gorgoniæ*, or sea fans, from the collection of Mr. I. O. W. Fabert, were exhibited by that gentleman. They had been recently obtained in twenty fathoms water, in lat. 0.30 N., lon. 105.14 E., near the island of Linga.

MR. MOORE stated that he had compared the *Comatula*

with the most recently published list of species, but could not at present satisfy himself with its identity with any therein enumerated. The series of *Gorgoniæ* consisted of exceedingly beautiful specimens of several distinct species, of which no examples existed in the museum.

DR. COLLINGWOOD communicated some experiments of M. Thury, professor in the academy of Geneva, who has made a discovery, which, if it be corroborated, will be one of the utmost value in the farm and homestead. He has arrived at a formula for obtaining cattle of either sex *at will*. It is necessary to exclude from the experiment those animals in which the signs of heat are vague and uncertain, as is observed in fat cattle and confined individuals; but healthy cows, and those living in the open air, must be used for the purpose. The experiments made upon cattle at Montel, appear to have been decisive, if we may judge from the following results:— “In the first place,” says the breeder, “in twenty-two successive cases I have sought to obtain heifers; my cows were of the Schwitz race, and my bull pure Durham blood. I obtained the result sought for in *every case*. Having later purchased a Durham cow, I sought to obtain a pure Durham bull calf, and succeeded, and have since obtained six other bulls, crossed between Durham and Schwitz. Altogether I have made twenty-nine experiments, and every one has given the result sought.” The importance of such a law will be evident, and especially will such results be valuable in countries where it is desirable to obtain oxen for working purposes; as in others, cows are the most valued animals. Moreover, the same remark will apply to sheep.

DR. COLLINGWOOD exhibited a photolithograph by the process Marquier, of Paris, and explained the manner in which it was obtained.

A paper was then read, of which the following is an abstract:—

ON LONGEVITY IN ENGLAND.

By THOMAS BALMAN, M.D.

AFTER some general remarks on the great interest manifested in very old people by all classes, and that they had long been regarded as the special *protégés* of crowned heads, he said—At page 102 of any volume of the Registrar-General's reports of the births, deaths, and marriages, we find recorded the deaths occurring in England at different ages, from the first year of infant life to the age of 95 and upwards: the last column also includes the deaths of persons who had either attained or exceeded the age of 100 years. The place where these deaths were registered is marked by an asterisk, and the precise age specified in a foot note. These he had collected together, and tabulated in such a way as to show how these deaths were distributed throughout the different towns and registration districts of England during a period of six years from 1855-60. The sum of deaths of centenarians during this period was 501; 157 males and 344 females, the average being 83. This was about the same proportion as France. Thus England, with a population of 20 millions, gave an annual average of deaths at the age of 100 and upwards of 83 persons which was 4 $\frac{1}{2}$ to every million of its inhabitants. France, with a population of 36 millions, gave an annual average of deaths at the same age of 148, which was exactly 4.111 to every million. It was generally believed that about one in every 10,000 attained the age of 100 years. His own calculations gave somewhat different results, and seemed to show that there were about two centenarians to every 10,000 deaths. For example, in six years, 1855-60, the sum of deaths registered in the metropolis was 366,581; of

these, 50 had either reached or exceeded the age of 100, giving 1·909, or say 9-10ths, very nearly two persons to every 10,000. Within the same period the sum of deaths registered for the whole of England and Wales was 2,549,182, and 501 had attained the age of 100 years; and, singularly enough, the result was the same, 1·9-10ths, or almost two persons to every 10,000 deaths.

Taking a period antecedent to this we find a higher ratio. In ten years—1831-40—the deaths registered in London were 348,018; of these, 24 were males and 55 females, making 79 persons who had survived to the age of 100, giving 2·270 to every 10,000, or a little over $2\frac{1}{4}$. In 30 years—from 1728 to 1758—the deaths recorded in England and Wales amounted to 750,322, and 242 were registered as having attained the age of 100, giving 3·225 to every 10,000, or say $3\frac{1}{4}$. Taking, therefore, a given number of deaths in the present and past centuries, without regard to time, the inference is that more people lived to be very old in the last than in the present century.

The census of the people lately taken confirms this supposition, as, notwithstanding the increase of population, the census of 1861 returned only 201, whilst that of 1851 gave 215 persons who had survived to the patriarchal age of 100 years.

Having seen the number of deaths of centenarians, the reader of the paper proceeded to portion them out over the different parts of England and Wales in the following way:—1st, into divisional counties; 2nd, counties; and 3rd, into districts and sub-districts. This part of the subject was illustrated by a series of tables, for which, from their great length, we are unable to find room. We, however, subjoin the first. It shows how these 501 centenarians are distributed over the 11 divisional groups of counties into which England is split up for registration and other purposes.

DEATHS OF CENTENARIANS IN DIVISIONAL COUNTIES, ARRANGED ACCORDING TO POPULATION.

	Male.	Female.	Total.	Population 1861.	Proportion to Population.
Welsh	30	59	89	1,312,834	1·14,750
Eastern Counties.....	18	27	45	1,142,480	1·25,383
South Western do.	20	48	68	1,835,714	1·26,995
Northern do.	16	23	39	1,151,372	1·29,522
West Midland do.	13	56	69	2,436,568	1·35,312
South Eastern do.	14	24	38	1,847,661	1·48,622
London	17	33	50	2,803,989	1·56,079
North Midland Counties..	8	14	22	1,288,928	1·58,587
North Western do.	10	31	43	2,945,540	1·68,268
South Midland do.	6	12	18	1,295,597	1·71,977
Yorkshire.....	5	15	20	2,015,541	1·100,777
	151	344	501		

The divisional counties returning the largest number of centenarians, and therefore most favourable to longevity, are Wales, North and South, returning 89, or one centenarian to every 14,030 of its inhabitants. The difference between the three next groups of English counties is slight; nevertheless, it is somewhat remarkable that the eastern division, embracing as it does immense tracts of flat marshy country, and in no great repute for its general salubrity, should take the palm from all the others for the superior longevity of its people. With regard to the three divisions that absorb very nearly one half of the whole population of England and Wales, viz, London, with the metropolitan portions of Surrey and Kent, Lancashire and Yorkshire, it is curious that London, with its huge and pent-up population, should compete so successfully with country districts, where the inhabitants are scattered, and therefore in a condition better calculated to preserve health and to prolong life. It seemed to imply that crowding or agglomeration of individuals, as seen in large cities, is not unfavourable to extreme longevity.

With regard to the next table, No. 2, which showed the number returned for each separate county, it would be observed that the healthiest counties were not always those that returned

the greatest number of centenarians. Heading the list, for example, was Lancashire, the county giving the highest death rate in England. At the bottom was Westmoreland and Rutlandshire, with a low death rate, and therefore among the most healthy of our counties. In the rear also was Northamptonshire, abounding in beautiful scenery and pastures, and containing more seats of the nobility and gentry than any other county. The two last did not return a single instance of a person dying at the advanced age of 100 years within the period before mentioned. The fewest centenarians were principally found in the north and south midland counties, and north-west of London. They were with few exceptions fine agricultural counties, and considered extremely healthy. Starting with Middlesex, we have Hertfordshire, Bedfordshire, Buckinghamshire, Oxfordshire, Northamptonshire, Huntingdonshire, Cambridgeshire, Leicestershire, Rutlandshire, Nottinghamshire and Derbyshire.

The counties giving the largest number of centenarians are, for the most part, in a position directly west of those above named, commencing with that peninsular tract of our sea-girt isle whose shores are washed by the Irish Sea. We have South Wales, Herefordshire, Monmouthshire and Somersetshire, then follow the two eastern counties, Norfolk and Suffolk, with North Wales. The counties next in order most favourable to longevity are the two northern, Northumberland and Cumberland, taking precedence of *three* of the *five* south-western counties, viz., Cornwall, Wiltshire and Devonshire.

From counties this little band of remarkable people were followed into minuter divisions of territory comprised in what were called districts. The 44 registration counties were subdivided into 623 of these districts. They were collections of contiguous parishes or places, and were generally identical with the poor-law unions of the same name. The following

analysis, for reasons explained, were mainly confined to town districts :—

Beginning with London, it was found that the majority of centenarians were stowed up in the worst parts of the metropolis. Whitechapel, which comprised the Artillery, Spitalfields, Mile-end, Old Town, with a population of 78,470, and having a death rate of 29 in 1,000, in 1862 returned the largest number. East London, embracing St. Botolph and Cripple-gate, the most densely populated part of the metropolis, with only 17 square yards to each person; the City of London giving 31, and St. George's, Hanover-square, 79 square yards to each individual, returned 4 centenarians; Bethnal-green, 2; Marylebone, 2; and Lambeth, 3. The fact of so many old people having been found in these parts of London clearly showed that they must have been in a very humble position, and in many instances were probably paupers or mendicants. Some might have resided on the banks, inhaling for half a century or more the sweet perfumes of that much abused river the Thames.

Liverpool told very much the same tale. This district, as defined by the Registrar General, is known as the Parish of Liverpool, and included St. Martin's, Howard-street, Dale-street, St. George's, St. Thomas's, Mount-pleasant and Islington. It has necessarily a very dense, and in some parts of it a most foul population, and any one at all acquainted with the filthy and ill-conditioned state of some of the courts and alleys in which a large proportion of the working and lower orders lived would scarcely be surprised to hear that the deaths had in several cases much exceeded the births. Was it not remarkable, under such circumstances, that Liverpool should return 8 centenarians, whilst the West Derby district, which included all the out-townships, which were pleasantly situated on the slopes and heights of the surrounding hills, and inhabited, for the most part, by the well-to-do classes,

should not give a single example of a centenarian within these six years? Exeter returned 4, whilst the Newton Abbot district, including Teignmouth, Torquay, Newton Ashburton, and with twice the population, and having a climate singularly mild and genial, gave only 1; and Plymouth, with 76,000 inhabitants, did not present a single instance.

There is one locality in England that contributes more to swell the list of old people than any other, and we could not refuse to regard it as the district the most generally favourable to longevity in our island. It is the estuary of the Severn and immediate vicinity of the Bristol Channel; on one side of it we have Somersetshire and Gloucestershire returning 43, being more than twice the average of the other English counties. The average for the forty English counties was about $10\frac{1}{2}$ to each county. The districts returning these deaths are Clifton 6, Bristol 2, for Gloucestershire; and Taunton 6, Bath 6, Bridgewater 4, in Somersetshire. On the other side of the channel we have two Welsh counties giving 33, Glamorganshire 22, and Monmouthshire 11. The districts returning these deaths are Merthyr-Tidfil 6, Neath 4, Cardiff 4, Swansea 3, Abergavenny 7. All these places are within a few miles of the Bristol Channel, and are among the most important iron and coal districts of South Wales. Carmarthen returned 4, Llandovery 3, and at the extreme west of the county of Pembrokeshire we have the ancient city of Haverfordwest giving 6.

SIXTH ORDINARY MEETING.

ROYAL INSTITUTION, 11th January, 1864.

JAMES A. PICTON, Esq., PRESIDENT, in the Chair.

Dr. COLLINGWOOD announced that the first list of the Committee for carrying out the Shakspeare Tercentenary Festival had been completed. He read the list, which included nearly seventy of the leading literary, scientific and commercial names of the town. He also stated that this Committee would meet at the Town Hall on Monday next to initiate arrangements.

Mr. BAILEY exhibited a drawing of the recent meteor, with a description from the pen of Mr. Alexander Herschel.

Mr. MOORE exhibited a stuffed specimen of the short sun-fish, *Orthagoriscus mola*, presented to the Free Public Museum by Captain E. Johnson, brig Ringleader. This fish measures five feet in total length ; is three feet high, or measuring from tip to tip of dorsal and anal fin, six feet six inches. It was captured on the 15th of September, 1863, in lat. 49° north, long. 9° west, by Captain Johnson, whose attention was first drawn to it by seeing it "fly about twelve feet forward out of the water." It afterwards appeared to be floating on its side, skimming the surface, probably feeding on the jelly-fish, which were very plentiful, and remains of which were subsequently found in the stomach. A boat was lowered and the fish harpooned, but it was with difficulty towed to the brig, for only when the fish lay on the surface of the water could the boat make way ; when it could assume its vertical position beneath the surface the boat was towed by the fish. The flesh was well flavoured, resembling codfish. Above three quarts of oil

were extracted from its liver. The occurrence of this species in British waters is sufficiently rare to be worthy of record.

Mr. MOORE also announced the addition to the museum of living specimens of the following species of fish from New York, viz. :—The fresh-water sunfish, *Pomotis vulgaris*, a pretty species, common in ponds; a species of catfish, *Pimelodus pallus*, with eight long sensitive feelers projecting from the snout and chin; and the sheep's-head lebias, *Lebias orina*, a diminutive salt-water fish. They were imported and presented by Captain Mortimer, of the ship America, on whom the society had already conferred its honorary degree of *Associate*, for his zeal in the cause of natural history.

A paper was then read, entitled

A VISIT TO SALZBURG AND THE SALT MINES
OF HALLEIN.

By R. HIBBERT TAYLOR, M.D.

The following paper was also read:—

ON VITALITY.

BY THE REV. H. H. HIGGINS, M.A.

THERE is at present amongst some very eminent physiologists a growing tendency to deny, or at all events to question, the existence of vitality as distinct from the action of known forces, such as heat, light, electricity, &c., or something analogous to these.

The views of the physiologists above referred to may thus be briefly stated :—

(1.) Of the nature of vitality we know nothing ; we are therefore not required either to admit or to deny its existence as a distinct thing.

(2.) The observed phenomena of life are consistent with, and, to a very great extent, derivable from, the operation of known laws : it is therefore not philosophical to introduce an entirely unknown agency to account for such residual phenomena as are not thus reducible.

The present paper will be devoted to the consideration of some questions bearing upon these two propositions.

It is a matter of comparatively little importance what term may be chosen to denote the object of our enquiry, whether it be "vitality," or "germ force," or the "vital principle," so that it be clearly understood to refer only to the ultimate element of life, and not to any even of the simplest functions of life. Seen under this aspect, vitality is simply the *sine qua non* of the animate individual,* whose very existence

* In assigning this position to vitality the writer is aware of the difficulties which beset the subject, especially in connection with the development of plants, and in respect of the lower forms in the animal kingdom, compound animals, the alternation of generations, &c. If, however, vitality can be shown to lie beyond the range of scientific investigation, in all these cases the knot is cut ; and whilst physical development remains in every instance a proper object of scientific enquiry, neither the relations subsisting between the vitality of a seed and that of the parent plant, nor any similar relations, can adequately be discussed as matters pertaining to natural science.

as such, stands or falls as vitality is, or is not, regarded as a distinct entity. Personality, which is a higher form of individuality, is equally dependent on the question whether vitality is, or is not, the result of forces such as we are accustomed to deal with in scientific investigations. It would be absurd to call a flame a person or an individual ; yet it has active qualities, a distinct form, requires aliment, &c. A man is not a person because he has these properties, but because he has a something which a flame has not. Whether this something be designated soul, or spirit, or will, or intellect, or vitality, is, I apprehend, all the same in respect of its relation to physical science, which cannot recognise metaphysical distinctions. In fact it is the question before us, whether on grounds of physical science we are competent to recognise vitality under any aspect as a distinct thing.

It must be evident that if the vital functions by which man is distinguished from a block of granite be the result of difference in the combination of the primary molecular forces of his living substance, he has no more right to be regarded as a person than has a thunder-storm ; his being is a process, and in general terms he may be described as a segregation of certain forces, initiated by a similar combination, and passing away into equilibrium, or into the general stock from whence he was derived.

The issue, however, must be tried not on its consequences, but on its scientific merits ; on which grounds, as I apprehend, whatever may be demonstrated concerning the vitality of man holds equally good with reference to the life of a monad, or of a particle of red snow. Still, if it can be shown on purely physical principles that vitality is a something which is not analogous to the actions of known forces, then life is, to all intents and purposes, a miracle, by which I understand not the action of a power in opposition to, or thwarting the physical laws of nature, but the manifestation of an agency extra-

cosmical, working harmoniously with, and by means of, those laws.

It may seem to some hardly worth the while to contend for the possession by man of a distinct vitality, if by this term is meant only that which he must hold in common with an animalcule or a seed. But a moment's reflection will make it plain how vast a step is taken if we gain from science the admission that her kingdom is not universal. None will be more ready than the man of science to confess how little is that which is known, when compared with that which still remains to be known ; nevertheless he is becoming more and more inclined to be convinced that all is *knowable*, and if known would be found conformable in all respects with the knowledge that he has already. So strong is this tendency that he is encouraged to entertain as possible, or even probable, theories that otherwise he would at once have rejected as monstrous and absurd—for example, the derivation even of the most exalted faculties of man, through a long series of almost insensible gradations, covering a period of millions of years, from ordinary forces which initiated the lowest forms of life. Now, if it can be shown that vitality, even in a vegetable cell, is a thing which lies beyond the scope of scientific investigation, the spell is broken, and a claim is established for the determination of what may or may not constitute the higher faculties of man, on other grounds than those of physical science alone.

As a believer in something more than natural science, it is proper for me to state that I do not think a rational persuasion of the personality of man must rest upon evidence to be obtained from physical researches. Still I should expect to find in science some indication of its own limits, and of the commencement of that border-land which separates the known from the unknown. More than this the very nature of the case forbids.

We may now proceed to the consideration of the two propositions given at the commencement of this paper as expressing the views of certain physiologists who decline to recognise in vitality anything beyond the operation of forces amenable to scientific investigation.

It will be observed at the outset that much stress is laid upon the absence of all knowledge respecting the *nature* of vitality. This limitation is needful, because to say that nothing is known of its effects would simply be to anticipate the decision of the question at issue. But it may at once be admitted that we know nothing of the nature of vitality. How should we, if it has no analogy with any of the known forces? For on this supposition, in what form could knowledge of vitality hold its place in our minds? Not in any of the old familiar forms, such as predicates respecting its quantity, intensity, polarity, and the like; for the thing thus known would have analogy with known forces, and would not be a thing *sui generis*, but would fall naturally into some recognised category. We have to give our reasons for concluding that certain observed facts imply the existence of an agency quite unlike any of the forces known to us. The reply that we know nothing of the nature of such an agency is certainly no disparagement to our hypothesis, unless it may be shown that nothing can exist of which we do not know the nature. If, then, we are at liberty to make the supposition that vitality is a thing *sui generis*, that we know nothing of its nature tells neither for nor against the probability of its existence.

One of the broadest generalisations deducible from the immense additions recently made to the ascertained truths of science is, that numberless things previously supposed to be distinct, are now found to be so closely related that it is impossible to draw a line of separation between them. This has been the case alike with things organic and inorganic. The great kingdoms of animal and vegetable life pass quite imper-

ceptibly the one into the other; and in both kingdoms the number of classes, orders, families, genera, and species, that show the same tendency is so great that where an isolated group is found it is thought to be probable that the links of connection are missing only because they are extinct, or are not yet discovered.

It is important for our purpose to notice the manner in which one group of living things passes into another. It will generally be found that the transition is not effected by the shading off or blending of the extreme edges of the groups, but by a kind of interlocking of the one into the other. The junction often resembles that of the sea and the land on the coast of Norway, where in many places it is hard to say whether it is the sea that runs far into the land, or the land that runs far into the sea. Thus, judged by one set of characters, an organic form may not only be a vegetable, but even hold a somewhat high place in the vegetable kingdom, whilst, judged by another set of characters, the same creature may not only be an animal, but have its place by no means on the confines of the animal kingdom.

Discoveries relating to the allotropic forms of matter and the correlation of the imponderable forces, warrant the same conclusion as to the close affinity subsisting between inorganic things.

In fact, that "nature does not proceed by a leap" might seem to be a rule that lacks the criterion of an exception; yet there is an exception, and a striking one; limits have given way in all directions, yet there is one that stands out as sharply and as distinctly as ever; that, namely, which divides animated things from those which are inanimate. No form of matter that is not animate exhibits anything approaching to the phenomena of life. Of course, none but a superficial observer would suggest the process of crystallization, or the dendritic appearances of some metals, or the moss-like forms

seen in agates, as exceptions. Neither can any instance of a degradation towards the character of inorganic matter be found in the very lowest forms of life, in the protozoa, or the sponges, or the nullipores, or the fungi, the *algæ*, the *conervæ*, or even in the single living vegetable cell.

Now, if the vital principle be analogous with any known form of matter or force, this solitary case of a great leap taken by nature is incongruous with all that we know of her other proceedings. If, indeed, the presence of life indicates the introduction of something entirely new, then we have a reason for the leap. But if not, the facts we have considered appear to be inconsistent with the hiatus between animate and inanimate things. If life be made up of forces similar to those which act in various ways both on organic and on inorganic matter, we might expect to find the transition from things inanimate to things animate the same in character with all other transitions in nature: the border-land would be occupied with semi-animate materials, and semi-mineral vegetables or animals, with instances of equivocal life, and products of doubtful organisation. Whereas, from the highest to the very lowest organism, even to the primordial utricle and cell, the phenomena of life are distinct and unquestionable. It is true that geologists have to deal with certain forms of doubtful organisation, found in the lowest rocks, but in these instances the difficulty arises from the changes through which the fossils have passed. There may be reason to doubt whether certain appearances truly indicate organic remains; but there is nothing to indicate that life, in the Silurian ages, was less distinct than it is now.

The above argument for the speciality of the vital principle, derived from the unparalleled solution of continuity in nature just at the point where life commences, demands, for its full illustration, rather a volume than a mere notice in a brief paper. Its force, if it have any, is evidently acquired from

facts revealed by the very researches which have led some to form an opposite conclusion.

Again, if vitality is analogous to, or correlative with, the known forces, we might expect to find at all events some resemblance existing between their respective properties and modes of action. Now the results of the action of heat, electricity, chemical affinity, &c., on various forms of matter have been much studied, and a good deal is known about them. Yet among all these results no single instance can be found resembling the commencement of the functions of vitality. It is, however, admitted that from the outset the vital principle works harmoniously with and by means of the known forces ; so that much of that which was wont to be ascribed to vital force is now known to be a chemical process brought about by the agency of light and heat. But the question is not what light, heat, &c., and vitality can do conjointly, but what light, heat, &c., can do without the presence of vitality, and the reply must, I think, be unfavourable to the correlation which is supposed to exist between vitality and the known forces.

It may be replied that none of the imponderable forces has ever been alleged to be the force of life ; yet if the latter force is correlative with any of the former, could it behave so differently ? For example, the known forces act universally : there is no kind of matter that is not at all times affected by heat, light, electricity, and chemical affinity : on the other hand, the force of life stops suddenly and definitely at a limit which excludes a large proportion of existing matter. Take any one of the known forces—heat, for instance ; heat has no zero, but from the lowest to the highest temperature its intensity increases uniformly : heat has been compared with vital force because, as it is said, when of sufficient intensity, heat produces motion. But surely it should rather be said that at all temperatures and amongst the particles of all bodies

heat *is* motion, and that this motion, inconspicuous at a lower temperature, simply becomes visibly manifest when a state of incandescence is approached. There is nothing in vitality answering at all to this. Let us turn to the correlative of heat, magnetism, which, like heat, is universally present, and has no zero—which, like heat, is capable of producing conspicuous motion, when collected in sufficient intensity—which, in short, in so many ways resembles heat, that the correlation of the two, now that it is known, seems obviously probable. So also of the other known forces; but not so of the force of life, which has a true zero, which does not act universally, which, in short, so little resembles the imponderable forces that their correlation cannot but be regarded as antecedently extremely improbable.

We may now pass again to the alternative: if vitality be not *sui generis*, it must be something analogous to the agencies with which we are acquainted. Now of these agencies collectively, the *most certain thing* that we can say is that they are strictly obedient to fixed laws: that under similar circumstances similar results invariably follow. So precise and constant is the operation of this rule, that, under favourable conditions, we are able to infer the antecedent from the knowledge of the effect, with as much accuracy as we can predict the effect from the knowledge of the antecedent. We are quite certain that no portion of a result, however minute, can have been produced without a corresponding character having existed in the antecedent. It is not contended that we are able to trace otherwise than very imperfectly the remoter antecedents of the facts observed in inanimate nature, but we are convinced that everywhere the supremacy of law is absolute.

If, for example, we could trace the history of a drop of water which trickles down the window pane, we should find that its volume, its direction, its temperature, and all its other

characters were derived from atmospheric and other agencies : and if the history of the drop could be submitted to a suitable kind of examination, it would yield up to us the exact qualitative and quantitative characters of all the forces which had collected it and sent it on its course. These forces would indicate their antecedents, till it might be seen that our drop was the inevitable and exact result of meteorological and chemical and mechanical changes and actions that had been going on continuously from the Silurian ages and for we know not how long previously.

Nor would the whole history of the drop, however remote its starting point, present any very complicated or difficult facts. Some of its particles may have come from the antipodes, or have belonged to the polar snows ; others, in a state of decomposition, may have assisted to lift a balloon or have been breathed by an ichthyosaurus, yet they were never for an instant beyond the grasp of those known laws which in the end brought them together to be a drop : every step in the whole course being, with the utmost precision, dependent upon the previous one.

Those who do not admit the vital principle to be a thing *sui generis* must assign to it a place under the dominion of laws, the rigorous character of the operations of which I have endeavoured to illustrate.* If the consequence of such an allocation can be shown to be difficulties unparalleled in magnitude, something will be done towards proving that the allocation is a wrong one, and that the vital principle is a thing not subject to the laws of ordinary forces.

Such difficulties arise in various directions when we begin to apply the laws which govern things inanimate to the phenomena of life.

It is well known that the common Hydra may be reproduced

* Be it remembered, once for all, that on this point there can be no playing fast or loose to suit the occasion. Vitality is, or is not, subject to the exact laws of nature.

by a small portion of its body severed from the rest, or even by a portion of one of its tentacles. On the supposition that known forces, or forces analogous to these, are alone concerned in this reproduction, it follows that in the severed portion must have existed physical peculiarities corresponding with *every part* of the entire animal : or, in other words, that the prototype of the perfect form to be evolved must have been in the particle capable of being thus developed. For known forces have no specific predilections of this kind, and except the bit contained that which could initiate the development in a particular direction, there is no conceivable reason why these forces should develope it into a Hydra, more than into an Amoeba or a Rotifer.

On similar grounds the seed must contain the perfect initium of the future plant to its most minute organs. The colour spot on the petal of a Pelargonium could in no conceivable way have been produced through the agencies of chemical affinities, heat, electricity, and the like, except from the existence of some corresponding physical starting point in the seed. This is admitted by some who question the existence of a vital principle ; and one of them, Mr. Lewes, has attempted to show the mechanical conditions of the embryo under which the serrated leaves of certain plants are produced.

On the other hand it may freely be admitted that if this wonderfully complicated structure did exist in the seed, it is by no means certain that we should be able to discover any traces of it. Our being unable to find it is no proof that it may not be there, unless we can show that in our investigation of the seed we have detected the ultimate forms of matter.

Here it is important to define what is meant by the existence, in the embryo prototype, of a structure corresponding in all respects with the future animal or plant to be developed. It is not contended that in the seed, for instance, the prototype

must fix in every respect the form and dimensions of the future plant ; for in the course of growth the plant is submitted to the variable influences of heat and moisture and light, and these will affect its ultimate condition, or it may suffer distortion from the attacks of insects or from mechanical pressure. Still, under all these possible influences every portion, every fibre of the living plant will be what it would not have been but from some peculiar character in the seed which initiated its production.

There is not a leaf on an oak tree but must have had its own share in the acorn from which the tree sprang. For let us remember we are trying the consequences of the utter exclusion of vital force as a special thing ; we have only to do with the results of the actions of known forces, which have no more tendency to produce a leaf than to produce an animal, except from the direction given to their energies by the original initium. In the action of these forces the result indicates the antecedent, as much as the antecedent the result. It matters not how many steps backward we have to go. The leaf takes its character from the bud, not, let us remember, by the influence of a vital force, but by a process of development brought about by heat, electricity, light, moisture, carbonic acid, &c., &c., acting on the bud. Then, I submit, the leaf in all its parts, down to its veins and stomata, must have been initiated by some special physical character in the bud. What have heat, electricity, &c., to do with forming veins and stomata ? Given the proper nucleus, these forces are quite competent to develope any number of organs, but no particle of the leaf must fail of having had its type in the bud, else, instead of that particle, there would have been an hiatus, or something of a different kind.

The bud imposes the same conditions on the twig : but, in fact, the conditions multiply as we recede ; for the twig has to furnish the starting points for the bud and all its leaves :

the twig, in like manner, looks back to the bough, till by the time we arrive at the acorn, it is useless to attempt to burden the mind with thinking of all its little shell must contain. Yet we have only gone back a single generation. That acorn was itself borne on an oak, which sprang from an acorn, which must have held the type of the types in the second acorn, and of every leaf of the tree which the second acorn produced. In fact if we conceive the oaks of the world to have sprung from a single acorn, on the hypothesis of those who deny the speciality of the vital principle, that acorn must have had in itself the types of all the oaks that have ever been produced. For agencies like those of electricity, heat, &c., can only work upon what they find ; and if there should be a bud on the last oak that had not its representative in the first acorn, that bud would be a result without a corresponding antecedent.

Let us remark that the difficulty we here encounter arises from the peculiar manner in which life is transmitted from living things to their successors. No difficulties of this kind met us in the history of the drop of water, though we saw that it had a history reaching back to the very limits of time. Its particles may have been many times round the world ; some of its parts may have been ice, or steam, or free oxygen and hydrogen. The changes they may have passed through quite exceed our calculation, but they were either chemical or mechanical : and though the series is long, the terms are simple—there is no accumulation of difficulty. In the case of crystals the nucleus is the requisite *initium*, or rather the molecules of the mineral substance have characters sufficient to determine the form of the crystal. But the crystal is homogeneous, and has no special organs such as are possessed by plants and animals. The production of such an organ as the eye from the mere development of physical peculiarities pertaining to the germinal vesicle and spot, can hardly be conceived to be possible.

In fact, the notion that every seed contained the perfect plant in miniature belonged to a former age, and has long been regarded as exploded ; yet it seems to me to be an inevitable conclusion, if no forces are concerned in the germination and subsequent growth of the seed, but such as are of the nature of light, heat, electricity, &c. It is, however, certain that the seed possesses vitality ; and without attempting to define what the vital principle may be, it appears reasonable to assign to it a certain special directive agency, by virtue of which it is enabled to apply the ever present forces of heat, actinism, &c., in the construction of a plant of its own proper species. But it is manifest that a vitality thus endued cannot be correlative with any of the known imponderable forces.

Another point worthy of attention is the stability of form and structure observable through many generations of the same species. Whatever may be the wondrous exactness of the embryo prototype, the accidental influences of heat, moisture, light, &c., in the course of growth are so great that it is hardly possible to conceive that, with *only* the physical character of the embryo (itself produced under these varying agencies) to determine the succeeding form, similarity should be preserved through so many ages and in so many collateral lines of descent.

The termination of life, on the supposition that the vital principle is analogous to known forces, ought to yield indications of some kind or other. Death is a common event, and one that lies completely open to observations of all kinds. In the animal world it is in our power to produce death under almost any conditions we may choose as most favourable for investigation : and it is an event so interesting that the discovery of its nature would be considered the greatest achievement of the intellect of man. Yet the nature of death is absolutely unknown : the most delicate tests for indicating minute changes in electrical, thermal, and other conditions

have been applied at the moment of death, and have shown no sign. Now it is certain of the forces of heat, light, motion, &c., that they are absolutely indestructible : they may be converted one into another, but they cannot cease to exist. If the vital principle was analogous to these agencies it might escape in any one of them ; but of this no well ascertained trace has been observed in any investigation of the phenomena of death.

The uniformity of the period through which life extends in any given species is a result that no one would anticipate if the vital principle be of the nature of the known forces. The physical elements of animals are said to undergo an entire renewal in the course of a few years. Surely, then, with renewed materials to work upon, and with something akin to the imponderables to do the work, animals should never grow old. Why should they—any more than oxygen should lose its vigour and grow tired of uniting with hydrogen ?

We have now noticed some of the considerations which appear to favour the supposition that the vital principle is a thing *sui generis*.

1st, the unparalleled hiatus which exists between things animate and things inanimate.

2nd, the great dissimilarity between the properties of the imponderables and those of vitality.

3rd, the difficulty arising from the hypothesis that the embryo of a living thing is developed only by agencies analogous with known forces.

4th, the permanence of form and structure observable during many generations of the same species.

5th, the absence of any indications as to what becomes of the vital principle at death.

6th, the periodicity of life.

It is not contended that these considerations amount to a demonstrative proof that the vital principle is a thing *sui*

generis, but the question naturally arises, how far, supposing our conclusion to be a right one, a demonstrative proof is possible.

An instance somewhat parallel may be found in the field of Natural Theology, in which is assumed, as a starting-point, the existence of a first supreme Cause, whose nature is beyond all comprehension; certain facts are adduced which agree with this assumption; also its rejection is shown to involve many great difficulties; but all this is not proof; and in fact proof here seems to be out of the question, for the simple reason that whatever *that* might be of which the existence could be proved, it would not be the infinite one. In logic, as in mechanics, action and reaction are equal, and the very *locus standi* required by a proof, in the thing to be proved, puts demonstration in this case out of the question. Similarly, if the existence of vitality as a distinct thing were capable of being demonstrated by direct proof, the vital principle must be of the nature of other agencies, which is contrary to the original hypothesis.

It would be very interesting to trace the course of those discoveries in physiology which have led some eminent observers to class vitality with other known forces. It cannot be denied that a very large number of facts connected with the phenomena of life, formerly supposed to be attributable only to the undefined agency of the vital principle, are now accounted for on principles which are purely scientific. For example, the constituents of some of the proximate elements of organic substances, such as starch, albumen, &c., were known long ago; but the power to combine these constituents so as to produce the proximate elements was regarded as being possessed by the vital principle alone, the working of which in the formation of the proximate elements could, it was thought, by no means be imitated in the laboratory. This is now known to be an error; the chemist by his science does

that which before was considered to be the peculiar function of the vital principle. In these and many other instances, it has been proved that the aid of the vital principle has been unnecessarily invoked to account for results explicable on scientific grounds.

In all this we have a parallel to that which has taken place in the more extensive field of the Cosmos. Yet there are some who are conscious that if it were possible to trace the existing state of things by a regular series of scientific deductions to a nebular condition of the universe, no approach would be made thereby to the possibility of dispensing with a first supreme cause.

It is, however, abundantly evident that the great Originator of nature has chosen to accomplish his purpose by a wondrous succession of fixed laws, open to our investigation, and revealing depth beyond depth to a most remote and obscure profundity.

With this fact before us, on the hypothesis that the force of life, like its author, possesses an unknown, perhaps an unknowable nature, we should not expect its interposition to be conspicuous; we should, I think, expect its agency to be executed only behind a succession of fixed laws, forming a vista, having its termination almost lost in the distance. The natural evidence in the two cases must of necessity, as we have seen, be of the same character, not direct nor demonstrative, but implied and inferential.

Whatever weight may be due to the considerations here urged in favour of the speciality of the vital principle, at all events they answer these expectations and conditions. Those arguments on which most stress has been laid arise at points where, if evidence be possible, any one who thinks at all on the subject, would expect to find it. Something altogether unusual in nature marks the boundary of the province in which life-force prevails; and the phenomena of life do not

submit to be accounted for under the rigid laws which govern the application of all forces that are known.

Since the greater part of the above was written I obtained the first number of the *Quarterly Journal of Science*, in which appears a paper by Dr. Carpenter, part first, "On the relations of Light and Heat to the Vital Forces of Plants." The views of so eminent an authority will everywhere command attention and respect, and it was not a little gratification to myself to find that on the whole they were consistent with those expressed in this paper.

By far the greater portion of Dr. Carpenter's paper is taken up with matters perfectly compatible with, but having no direct bearing upon the question we have had before us. In one short sentence, however, he thus states and illustrates his views on the point in question:—

"The history of a living organism then is one of incessant change, and the conditions of this change are to be found partly in the organism itself, and partly in the external agencies to which it is subjected. That condition which is inherent in the organism being derived hereditarily from its progenitors, may be conveniently termed its *germinal capacity*: its parallel in the inorganic world being that fundamental difference in properties which constitutes the distinction between one substance, whether elementary or compound, and another; in virtue of which each behaves in its own characteristic manner when subjected to new conditions."

That which I have spoken of as the vital principle, Dr. Carpenter here seems to denominate the "germinal capacity;" but without attempting a definition of the germinal capacity, he gives an illustration which amounts to this:—That the germinal capacity of one living thing, differs from that of another living thing as an atom of hydrogen differs from an atom of oxygen. We do not require an illustration to be perfect in all respects, and, on the

whole, this one seems to me to answer its purpose. But if it be contended that the illustration goes much deeper than I have represented, then in reply, I must urge, with the highest respect for the author, that the sentence is not so lucid as I am sure Dr. Carpenter himself would wish it to be ; that a capacity cannot be parallel to a fundamental, or any other difference ; and that certainly it cannot be Dr. Carpenter's meaning to compare the germinal capacity of an organism with the atomic properties of an inorganic substance, when, according to his own showing, the former produces "*incessant changes* ;" the latter, permanent combinations ; the former is "*derived hereditarily from its progenitors* ;" the latter can in no sense be said to have had progenitors ; the former is the "*inherent condition*," the latter the chief source of the influence of external agencies.

In fact nothing can be more satisfactory to myself than the distinction which Dr. Carpenter in another part of his paper draws between heat as the "*constructive force*" and the "*germinal capacity*," the vital principle of this paper, as the directive agency in the development of the living organism. He compares the germinal capacity to the control exercised by the superintendent builder who is charged with the working out the design of the architect ! Heat he compares to the bodily force of the workmen who labour under his guidance in the construction of the fabric.

This is indeed saying all that I would wish to say much better than I could myself have expressed it. The only remaining question is, will other physiologists be content with this—content to leave far out of the reach of their correlative forces the vital principle, the "*germinal capacity*," the working of the "*superintendent builder charged with the execution of the design of the architect*." I think not, and therefore, I venture to submit, the arguments of the preceding paper are not needless ; for it may be remarked of the nature of the

germinal capacity, that though he admits that it occupies the very first place in importance, Dr. Carpenter does not, I believe, say anything beyond what has been quoted.

In the commencement of his paper, Dr. Carpenter speaks disparagingly of a class of reasoners who uphold a "hypothetical vital principle, a shadowy agency that does everything *in its own way*, but refuses to be made the subject of scientific examination." There is an amusing similarity between the statement concerning the vital principle here ascribed to defective reasoners, and the statement which Dr. Carpenter makes respecting his own "germinal capacity," at the close of his paper. "The special attribute of the vegetable germ is its power of utilizing *after its own peculiar fashion* the heat which it receives, and of applying it as a constructive power to the building up of its fabric after its characteristic type."

SEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, 25th January, 1864.

JAMES A. PICTON, F.S.A., President, in the Chair.

Mr. F. T. Roberts, M.B., and B.Sc. (Lond.), and Mr. James Birchall, were balloted for, and elected members.

The Volume of Proceedings for the past Session was laid upon the table, and announced to be ready for distribution.

Mr. MOORE exhibited some remarkable specimens of *Septaria* from the lias at Cheltenham, as well as some other objects lately presented to the Museum by Mr. S. Bendall of that town.

Mr. MORTON exhibited some interesting fossils from the Lingula flags of North Wales, including good specimens of the great Trilobite, *Paradoxides Davisii*.

An interesting discussion took place upon the subject of the recent explosion in the Mersey. Mr. TOWSON exhibited the momentary effect produced upon the barometer by means of a tracing of its self-registering indication.

A paper was then read

ON THE RELATIONS EXISTING BETWEEN THE
DIMENSIONS AND DISTANCES OF THE SUN,
MOON, AND EARTH.

By JAMES SMITH, Esq.

EIGHTH ORDINARY MEETING.

ROYAL INSTITUTION, 8th February, 1864.

J. BAKER EDWARDS, Ph.D., F.C.S., V.P., in the Chair.

Mr. J. R. Cuthbert was balloted for, and elected a member.

Mr. MOORE exhibited some bones of the *Moa* brought from New Zealand by Sherbrooke Walker, Esq., of Bathafarn Park, Ruthin, North Wales, and kindly presented by him to the Derby Museum. They consist of a right and left femur, two left tibiae, and two left metatarsi, one fragment of tibia, and two vertebræ, of the largest known kind, the *Dinornis giganteus* of Owen. The height of the bird was estimated by Professor Owen at ten feet. No remains of this species hitherto existed in the museum, and although since the first discovery, consisting of a single fragmentary bone, in 1839, considerable numbers of bones of ten or eleven different species had been brought to England and deposited in the museum of the College of Surgeons and the British Museum, but few were referable to this species, the collection of Mr. Walter Mantell, consisting of 700 or 800 bones, containing a smaller and less perfect series than those now exhibited.

Mr. SHERBROOKE WALKER, who was present, stated that the bones were found in a limestone cave at Blue Cliff Station, in the province of Canterbury, by Mr. Poigndestre, proprietor of the station, who presented them to him during his late residence in New Zealand. To get into the cave the discoverers had to let themselves down by a rope, and crawl into the cave on their hands and knees. The bones were found lying on the floor in loose soil among a large quantity of others, bones of *kakas* (parrots,) *wekas* (wood-hens,) &c.

An interesting discussion took place, and on the question as to the extinction of these gigantic birds, Mr. SHERBROOKE WALKER stated that "the Maories, in New Zealand, certainly have some traditions respecting it, but it is questionable if they can be relied on. They say that formerly the Moa birds were very numerous, and used to kill the native children, so that at last, fearing that if they did not destroy the race of moa birds that the Moas would exterminate theirs, they held a council and determined to burn the island, and, according to them, a day was fixed, and the whole of the east coast was set fire to at the same time, whereby the gigantic race of birds was entirely destroyed. Whether there is any truth in this report or not, it is impossible to say, but it is very evident that all the east side of the middle island was once heavily timbered, for go where you will, on hills or plains, you will find large burnt logs of a species of pine, called by the natives 'Totara,' which never decays in the ground; and also, but much rarer, burnt logs of a sort of cedar, now quite extinct on the island. These logs are charred on the outside, but as sound as the day they were burnt when you take the outside off. None of the other sorts of wood which decay in the ground are ever found, thereby clearly showing that it must have been some time since the island was burnt, for all traces of other woods, too, have vanished. You will ask, possibly, how it happens that there is any timber at all left in the island. I can only account for that, by supposing them to have been protected by a swamp or river. We sometimes find the moa bones in swamps, which would lead one to think that they might have fled into them for protection from the fire. Many people believe to this day that they still exist in the unexplored forests on the west coast, and I confess I am not altogether incredulous of their existence myself. I only know of one instance of a Maori saying that they had seen one personally, which was to a friend of mine, whom an old woman told that

when she was a child she remembered having seen one, and described the place where she had seen it, which was an open tract of country towards the west coast. My friend, thinking that it sounded as if there was some open country there, went down on an exploring expedition, and found the place exactly as she described it, but no Moa bird. He ultimately took up the country for sheep farming purposes. The Maories have also traditions that these birds used to go into caves, and that their ancestors made large nets of the New Zealand flax (*Phormium tenax*) and, having caught them, used to eat them. Another friend of mine was told by the natives, when he was going up into the interior of the country, that he would be sure to see Moas, but that they would not hurt him ; however, he never saw any. There had been several reports of Moas having been seen, but hitherto none of them have been confirmed."

Mr. MOORE exhibited a stuffed specimen of the New Zealand owl-parrot, *Strigops habroptilus*, (G. R. Gray), from the Derby Museum, the species referred to in the following note lately given to him by Mr. Walker, detailing a very singular habit :—“ You asked me for some information respecting the ‘ Rakapo,’ or large New Zealand ground parrot. It is found in great numbers on the west coast of the Middle Island, but very rarely any where else. It is about the size of a common fowl, with a varied black and green plumage. The only one I ever saw alive was brought from the west coast by Mr. J. C. Watts Russell, of Canterbury. It was evidently a night bird, as it always hid itself under some thick plant (being kept in a small patch of enclosed flower garden) in the day time. It cannot fly at all, and has a very singular way of progressing, giving a hop forward, and then putting its head down and resting its forehead on the ground. At first I thought this might arise from the specimen I saw having a broken leg ; but Mr. Watts Russell, a gentleman of undoubted

veracity, and who must have had plenty of opportunities of studying their habits (having lived upon them for some time whilst on the west coast), assures me that they never use any other mode of progression than that I have described, viz., using their head as third foot, as it were ; much in the same way as we see the common parrots use their bill as a third foot in climbing. It is entirely a ground bird, and is singularly like an owl, on account of the feathers radiating away from the eyes, as in the owl tribe."

Mr. WALKER exhibited a number of animals collected from the Gulf-weed during his homeward voyage, consisting of specimens of Pipe-fish (*Syngnathus*), Painted Hand fish, or Toad-fish (*Cheironectes*), several Crustaceans and *Veellæ*; two small *Cephalopods*; two *Nudibranchs* and an *Acaleph*, which he presented to the museum.

EXPERIMENTS WITH ROTATING DISCS.

Mr. ALFRED HIGGINSON exhibited some Experiments with Rotating Discs, and made the following observations :—

Any body, even of irregular form, when made to rotate rapidly, will (if free to do so) arrange itself in such position as to spin round its shortest axis ; that axis moreover passing through its centre of gravity ;—and, if the rapid motion could be sustained, would show the various phenomena of gyration. The regular form of an oblate spheroid, or a disc with thickened margin, is however, the most convenient figure. Such a body when supported, and spinning, on its very centre of gravity, will not of itself change the direction of its axis, or its plane of rotation ; but will resist any effort to change it by a force applied from without. This may be called the *balanced top*, the centre of gravity and centre of motion coin-

ciding ; and the top, when spinning or not spinning, will rest at any inclination at which it is placed.

When the centre of gravity is below that of motion or support, the top when at rest will always assume a perpendicular position of its axis. This may be called the *under*-balance top.

When the centre of gravity, however, is above that of support or motion, the top when not spinning will fall over, and may be called the *over*-balanced top.

Mr. HIGGINSON exhibited an instrument, invented by himself about the year 1829, capable (in its present more accurate form) of spinning for fifteen minutes, and in which these three different adjustments of centre of gravity and centre of motion can be made at will.

1. The *over*-balanced condition was shown to correspond to the familiar toys, peg-top, whip-top, humming-top and teetotum. When rotating with the axis inclined, it was shown that a gyration takes place in the *same* direction as the revolution of the disc, and the toys named move also in an *orbit* in the *same* direction when travelling on the floor or table.

2. The *under*-balanced adjustment corresponds to the real condition of the earth in its diurnal rotation on its axis ; but the gyration is in each instance in a direction the *reverse* of its rotation ; and is, in the case of our globe, the cause of the precession of the equinoxes.

3. The *balanced* state of Mr. H.'s instrument is identical with the condition of the Gyroscope, when well made and not subjected to extra weight and pressure from without ; and the experimenter believed that many of its seemingly capricious movements were explicable on the principle of the sudden conversion of the disc of the Gyroscope from the *over*-balanced to the *under*-balanced top, or *vice-versâ*, with their distinct and opposite gyrations. These gyrations themselves are easily intelligible on physical principles relative to the action of two or more forces.

In the *balanced* top, when spinning in an oblique position, each particle at the equator will be carried from one node to the exact opposite, and there will be no alteration in the direction of the axis of rotation; while in the *over-balanced*, the node will be carried forward in the *same* direction as the spinning, and in the *under-balanced* the node will be thrown back in a direction the *reverse* of the spinning. In each case, the obliquity of the axis is not changed; but in the one it revolves at the same angle in the direction of, and in the other opposed to, the spinning of the top.

Spin the Gyroscope (with double gymbals,) and when the axis is vertical it will admit of being pushed round horizontally with perfect ease in the *same* direction as its rotation, but resists completely an impulse in the opposite direction, until the disc has turned itself upside down; the rotation is then in harmony with the impulse, and it will turn without difficulty; reverse the impulse, and it will not move round until the disc has reversed itself. Couple the two rings of the Gyroscope firmly together and it will then turn freely in either direction, without reversing its poles. When free to move, it was the *over-balanced* top, and it acted accordingly. Now place the axis horizontally, and with a thread attempt to raise one pole; gyration will ensue in a direction opposite to the rotation;—it is the *under-balanced* top, in all essential conditions. A weight hung at the other end of the axis produces the same effect as the thread in this experiment.

Mr. Higginson expressed the hope that any member of the Society, who might not be at once convinced of the validity of his statements, would yet feel sufficient interest to follow up this curious subject with investigations of his own.

The following paper was then read—

ON THE
DETONATING METEOR OF DECEMBER 5TH, 1863.

BY ALEXANDER S. HERSCHEL, Esq.

(Communicated by F. J. Bailey, Esq.)

Meteors of the detonating class are rare and their occurrence deserves a more careful consideration than a cursory notice of their appearance in the columns of the daily newspapers can supply. Professor Heis, director of the Royal Prussian Observatory at Münster, set an excellent example to Meteorologists in the early part of last year, by the personal enquiries which he undertook and completed upon the track of the meteor of March 4th, 1863, in the southern part of Holland. This great meteor offered small difficulties to an astronomer of Professor Heis' experience, from the length and small inclination of the visible path by which it approached the earth. Many distant places contributed their observations, by which the beginning and end of the rectilinear flight could be determined with precision, and hence it was possible to infer that the luminous body was foreign to our solar system and came from the trackless region of the stars.

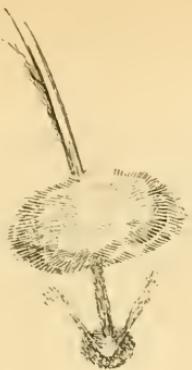
The occurrence which now demands our attention is that of a detonating meteor in England, on the 5th December last. Mr. R. S. Hart writes on the subject to "The Times," from Hawkshead, Windermere, as follows:—"The evening was calm and clear. From four to five minutes after the disappearance of the meteor a distant rumbling sound, which continued for two or three seconds, and resembled that arising from a railway train passing over a bridge, was distinctly

heard by myself and others. It came from the south-west, the direction towards which the meteor seemed to fall. Although the circumstance has not been alluded to by any of your correspondents, there was no doubt entertained by those who heard the sound, that it was occasioned by the meteor." It is sufficient to awaken our interest in this astronomical occurrence to be assured that a body so near the confines of empty space as to light the whole of England with a flash like lightning should be perceptible to our restricted and material sense of hearing. What then were our more ethereal organs of perception able to witness of the event ?

We may recall the appearance which the meteor presented at Liverpool, at Oldham (Manchester), at Burton-upon-Trent, at Preston and other places.

Mr. W. G. Drysdale writes—" It at first assumed the form of a falling star, and such I took it to be, until after descending several degrees, it suddenly burst forth into a large blue light, so brilliant as to cast shadows from objects on the earth. As this light was fading, a drop or pendant, of a dull red colour ran down from it and terminated in a small explosion. The diagram represents the image left on my mind after the disappearance of the whole." (Fig. 1.)

Mr. W. Bentley writes from Oldham—" At the time of its maximum brilliancy it was as light as the finest moonlight night. At the commencement it was as a ball of fire of one-third the apparent diameter of the moon, and of a lemon-shape and brightest at the lowest point. It proceeded some distance, leaving in its track a band of fire of a bluish white colour, when a very bright jet of fire was projected from the lowest part of the ball some distance. The whole of the ball was instantly a mass of fire, of the most brilliant kind, surrounded especially on the upper side with a vivid blue flame, and became suddenly extinguished, leaving a band of red flame which appeared to be cut in two at the point where the ball was."



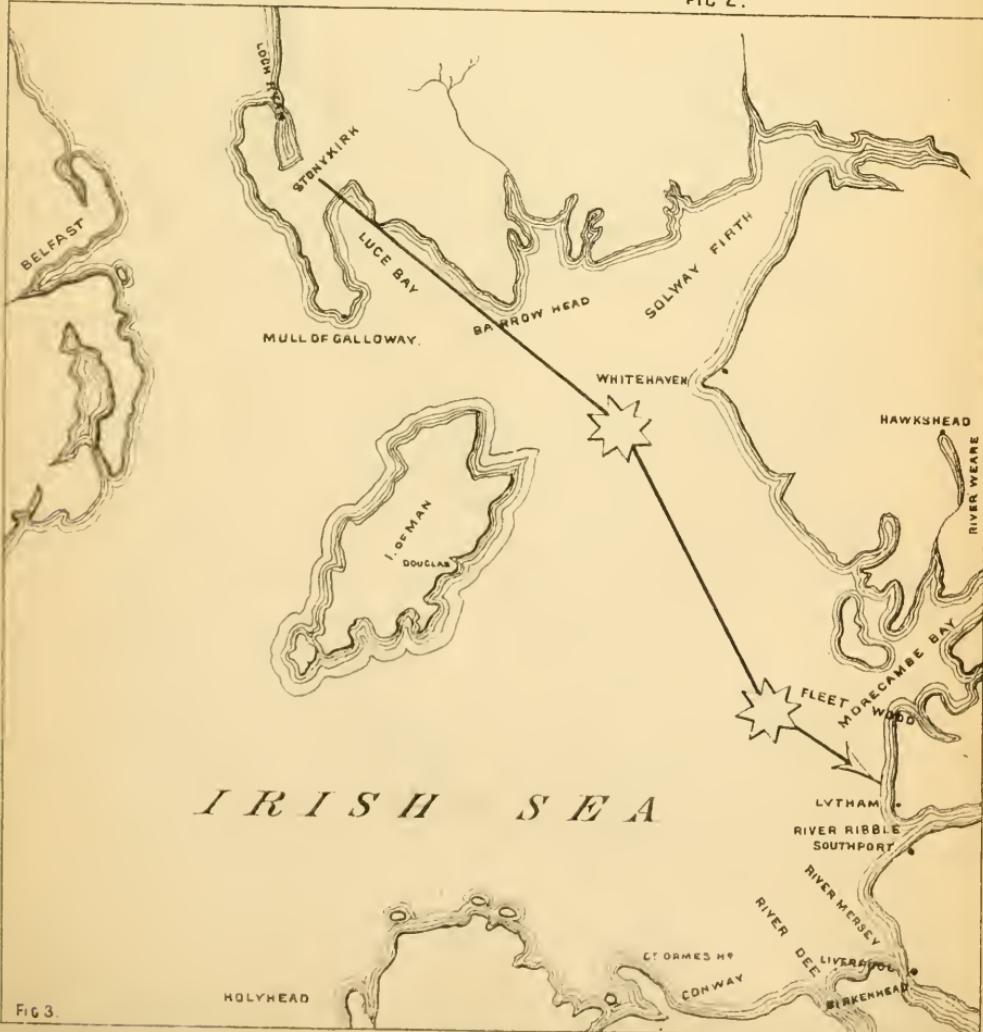
APPEARANCE AT LIVERPOOL.



APPEARANCE AT HASTINGS.

FIG 1.

FIG 2.



The following is the description at Burton-on-Trent—"On looking up, I perceived a globe, at least four times as large as Jupiter appears to the naked eye, of a pale blue colour, and of an intense light. It fell vertically through an arch of about fifteen degrees, and vanished, emitting during its passage four or five balls of crimson red light. The pale blue light of the meteor was most brilliant, and, contrasted with the red balls emitted from it, produced one of the most gorgeous sights it has ever been my fortune to witness."

At Blyth (Northumberland), Mr. M. W. Bullen describes the flakes of crimson red light as "pear-shaped drops left behind, as if from a molten body."

At Preston the meteor appeared "as a ball of fire about half the size of the moon, followed by a brilliantly red and fiery train of a more permanent and fixed appearance than usual. The nucleus emitted a blue purple light of a flickering and glaring character, as if the ascensional tendency of flame were impeding its descent towards the earth."

At Selkirk the meteor was described as "round and large, looking like the moon descending with a waving motion behind a bank of clouds."

At Parkhill, near Inverness, it "vanished in a vertical direction amid a shower of apparently falling fragments, which at the same instant assumed a deep red colour."

At Howden, near Hull, it was "a nucleus of brilliant light descending quite vertically in a momentary transit to the earth. When in appearance it touched the earth it exploded like a shell from a mortar. The fragments were of a most brilliant red, but no tinge of blue was observed."

The explosion appeared to Mr. R. Sutcliffe, at Idle, near Bradford, like the discharge of a rocket, burst before him at the distance of a few hundred yards, altogether unlike an ordinary meteor or falling star. The lights seemed purple and blue and white.

At Ledbury it "gradually descended in a perpendicular direction, emitting bright sparks as it fell."

At Stretford, near Manchester, the two flashes of the meteor (the second brighter than the first) drew the attention of the observer, who turned about in time to see them falling,— "purple and yellow balls of light which illuminated the country for a few seconds, and disappeared."

The two flashes were seen at Liverpool by Mr. F. J. Bailey, in a place where high buildings obstructed the view of the meteor, "immediately succeeding each other, of a blue tint, similar to the blue-light in colour, and lasting some five or six seconds, passing from the N.W. to the N.E., not far from the situation of the polar star."

Mr. A. Brothers writes from his observatory in Manchester—"While observing *a* Andromedæ about 30 minutes past the meridian, through a telescope of $5\frac{1}{2}$ inches aperture, with a power of 30, I distinctly saw two explosions as the meteor seemed to cross the field of the telescope. The light was more brilliant on the west than on the east side, but the effect was so instantaneous that it is not easy to say what was really seen. Of these facts I am certain—the meteor burst *twice*, and the colour of the light was blue."

An observer at Little Horton, Bradford, "walking in the open air, was startled by the sudden light. On looking up, the meteor remained in sight three seconds, and disappeared in a coruscation of light formed of the brightest hues."

Mr. W. E. Buck, of Hastings, avers that the meteor was of the same brightness from first to last, but shot or exploded three different times, "that is to say, when first observed, and twice afterwards (see fig. 2). At each of these explosions the brilliant nucleus appears to have been enveloped in red flakes and debris of the shock," for an observer at Chesterfield writes—"The meteor appeared first as a large white ball, then it changed to red, then white or green, and before it was

extinguished red again." He adds, "I saw the meteor of the 8th December, 1861, and it was quite similar to this one. The meteor of that date suffered two dismemberments of its body into red masses, and expansions of its light, the first at fifty miles over Lancaster, where a powerful report succeeded, the second at forty miles above the Irish sea, where the meteor disappeared." A writer at Hale, near Manchester, does not particularize any changes of form after the illumination attracted his attention to the object—"The nucleus was white and its train purplish red. It emitted sparks like those from a blacksmith's anvil."

At Kingstown, County Dublin, Ireland, "a ball of blue flame with a long feathery tail of fire, extending behind and upwards, lit up the eastern sky for several seconds like a broad flash of sheet-lightning. It finally emitted some brilliant sparks and descended into the sea."

At Douglas, Isle of Man, "the shape was that of a broad-headed spear, the blade of which, of pale green flame, was equal to the apparent diameter of the moon in length, and about half that extent in apparent breadth. The part next to it, say the shaft, was of a deep red, continued in a chain of flame of the colour of ordinary gas-light. The whole appearance occupied about the time which would be taken by a common rocket to exhaust itself." No explosion was heard, and no mention is here made of changes of form or brilliancy of the meteor.

According to the account of Mr. W. G. Drysdale, at Liverpool, before mentioned, "the meteor at first assumed the form of a large bright star and fell rapidly some distance through the atmosphere. Its motion was then suddenly arrested, and it burst forth into a dazzling pale blue light, so large and intense as to cast a strong shadow from objects on the earth. From this magnificent centre a pendant ran down, terminating in a ball of lurid red, like an ear-ring of fire. "The meteor appears,

therefore, to have been diverted from its original course as a falling star, at the moment of its brilliant expansion into a ball of pale blue light, and from this instant to have directed its course directly upon Liverpool, until at the final explosion and fading of the blue light, the lurid portions of the meteor again assumed a course parallel to their original direction. An observer in the open country, about eight miles from Manchester, informed Mr. Brothers that "at first the meteor appeared stationary, and his first thought was 'that's a strange place for Venus to be in,' when the meteor immediately darted downwards diagonally." This observer could, unfortunately, not give particulars of the position in which the meteor at first appeared stationary as a large bright star, but we are able to infer from this observation that before the meteor turned towards Liverpool as a fire-ball, it was directed in the form of a shooting star towards Manchester, and that at last, on the second shock, it followed in its expiring condition the same direction which it had originally at the outset.

The two changes of course were attended by distinct flashes of light, between which no great alteration of figure occurred in the meteor, but one coruscation, brighter than the rest, may, perhaps, be traced to have intervened. Those whose attention was attracted by the first flash noticed no change of direction. The alteration of course of the fragments at the final explosion was, however, observed in one instance at least (at Parkhill, Ross-shire), and ascribed to the effect of gravity on the liberated parts.

As a fireball, it had not a great length of run. Its angular extent at Hereford was only 2° ; at Liverpool it was foreshortened to a point; at Douglas and at Preston it appears to have measured from 15° to 20° ; at Manchester and at Burton-upon-Trent from 12° to 15° . The thick rain and dense clouds which hid the sky appear to have caused a perfectly erroneous impression of the meteor as observed at Hastings. The explosion

at Haslingden, near Blackburn, in Lancashire, took place at at 4 degrees under α Lyræ.

The meteor appears therefore to have originated as a shooting star at 90 miles above Stonykirk, at the head of Luce Bay, Wigton, in Scotland, and to have thus advanced to 60 miles above the Irish sea, 40 miles due west from Hawkshead, Windermere, where it altered its course and expanded in light with a loud explosion, audible at Hawkshead, like the roar of a railway train. From this point the meteor moved as a fireball of the largest size towards Liverpool to a place 30 miles above the sea, and 17 miles West of Fleetwood, where it again underwent an explosion, with alteration of its course, and great expansion of its light terminating its display. The fragments moved from this point towards Manchester, and disappeared at a height of 20 miles above the neighbourhood of Lytham, on the coast of Lancashire. (See map, fig. 3.)

The distance from the point of first explosion to Hawkshead, Windermere, is 72 miles, and this interval is recounted by Mr. R. S. Hart to have been travelled by the sound in the lapse of from "four to five minutes." The velocity of the meteoric sound was, therefore, somewhat greater than a mile in four seconds of time, or than that ordinarily received as the velocity of sound in a horizontal plane of air.

At this meeting a paper was also read—

ON THE
LEPIDOPTERA OF THE HUNDRED OF WIRRAL,
WITH A LIST OF THE SPECIES.

BY J. FITZHERBERT BROCKHOLES, Esq.

[This paper and list will be found in an APPENDIX at the end of the volume.]

NINTH ORDINARY MEETING.

ROYAL INSTITUTION, 22nd February, 1864.

REV. C. D. GINSBURG, LL.D., V.P., in the Chair.

Ladies had been invited to this meeting, and there was a large attendance.

Mr. MOORE exhibited the following recent additions to the Free Public Museum :—A splendid pair of reindeer (*Tarandus rangifer*), obtained expressly from Lapland by S. R. Graves, Esq., by whom they were presented to the Museum. A very large calamary or squid presented by Capt. Graham, screw-steamer Nova Scotian; in lat. $47^{\circ} 51' N.$, and lon. $38^{\circ} 16' W.$ that vessel, while running before a strong gale from the westward, Feb. 13, on her voyage from Montreal to Liverpool, shipped a heavy sea, when it was supposed to have been washed on board, as it was found on the forecastle about two hours after at daybreak. The specimen, the species of which is at present undetermined, belongs to the family of cephalopods, of which the *Loligo vulgaris* of the British seas is an example. It is, however, very much larger, the body being 26 inches in length, the eight ordinary arms surrounding the mouth varying from 13 to 15 inches, and the two extensile arms, measuring 40 inches, so that when these are stretched out, the total length of the creature is six feet. It lived for some hours after it was discovered, and was then kept in ice for six days. It arrived in perfect condition, and is a very interesting addition to the series of these creatures contained in the Museum. Also a globe of living fish taken from the Nile at Hagar, where the river is crossed by the railway, by Mr. Hardcastle, C.E., in charge of the line, who gave them to Captain Browne, of the screw-steamer *Agia Sofia*, who kindly presented them to the Museum. They are a species of carp, closely allied to the gold carp.

Captain BROWNE exhibited a pair of slippers, taken from an Egyptian mummy, and elaborately ornamented in gold, and having an inscription upon them also in gold. This inscription the Chairman stated to be in Coptic.

The Rev. H. H. HIGGINS exhibited a large specimen of *Chiton*, lately purchased for the Museum. It was obtained at Vancouver's Island, and appeared to be undescribed.

Dr. COLLINGWOOD explained a very beautiful diagram, made at the Liverpool Observatory by Mr. Hartnup, exhibiting the indications made by the anemometer, barometer, thermometer, &c., in the great gale of December 5.

A paper was then read, entitled—

THE GOOD OLD TIMES.

BY REV. JOHN ROBBERDS, B.A.

TENTH ORDINARY MEETING.

ROYAL INSTITUTION, 7th March, 1864.

J. BIRKBECK NEVINS, M.D., V.P., in the Chair.

M. F. Archer, jun., B.A. Cantab., and Thos. Skinner, M.D., Edin., were duly elected ordinary members.

The PRESIDENT drew attention to the recent death of Sir William Brown, Bart., one of the honorary members of the Society, and a resolution was passed expressive of sympathy with his family. It was suggested that members of the society who could make it convenient to do so should attend the funeral as representatives of the society.

Mr. GEORGE S. WOOD made a short communication on the subject of the gyroscope, illustrated by experiments.

The following paper was then read—

THE ARITHMETIC OF BUILDING SOCIETIES.

By J. M'FARLANE GRAY, Esq.

BUILDING SOCIETIES generally have for their object to enable working men to become the owners of house property, which is purchased with money borrowed from the Society, and repaid by small periodical instalments, which include interest at about 7 per cent. per annum. By receiving this high rate of interest these societies are enabled to give a proportionately high rate of interest on the money entrusted to them, and become an eligible investment for those small sums which form the savings of the working classes.

In Liverpool, as far as I can learn, there are three classes of Building Societies—the Terminating, the Accumulating Permanent, and the Dividend Permanent.

A Terminating Society begins at a certain date and has a time fixed for its ending. In general its object is to yield to every investor of 10s. per month the sum of £120 at the termination of the Society. To enable them to accomplish this object, the subscriptions of the members are lent out among themselves at such a rate of interest as will increase the subscriptions to the promised amount in the given time. This description of Building Society is fast disappearing, and almost all new Societies are formed on the permanent principle.

An Accumulating Permanent Society is much the same as a Terminating Society, but its operations are continuous. A member can join it at any time without paying up any arrears, and when his subscriptions have continued for a specified

number of years he receives the full amount of his accumulated share, with whatever bonus may have been declared upon it, and he withdraws from the Society, but the Society itself is permanent.

This form of Building Society was first proposed by Mr. Scratchley in his large work on provident associations. The erroneous principles in the working of the terminating Societies were therein fully discussed, and the superiority of this new class of Society pointed out. It must have been highly gratifying to that author to find that, all over the kingdom, steps were taken to wind up Terminating Societies and to form others on the permanent principle, as he had recommended.

The success of all such associations is entirely due to the operation of compound interest. In both of these descriptions of Building Societies the principal feature was the accumulation of the profits from year to year, and thereby the realisation of compound interest. It is to Liverpool that the credit is due of having discovered how to realise equal advantages to the investor without this accumulation ; the British Building Society in this town was the first to put this plan into practice, and to divide its profits annually ; and now there are in Liverpool fifty or sixty permanent Societies on this plan, all giving yearly or half-yearly dividends. I will restrict this paper to the arithmetic of these new Societies, —the Dividend Permanent Building Societies. The construction of the others has been already fully discussed by Mr. Scratchley in the work referred to ; but this new class, which we find so common in Liverpool, as far as I can discover, is not treated analytically in any work. The stock of these Societies consists of an unlimited number of shares, which are generally £10 each, with an entrance-fee of one shilling per share. The entrance-fee is sometimes increased as the Society progresses, and is in proportion to the amount of

reserve fund in its possession. These shares are lent out to borrowers, who pay a certain premium for the advance, and return the principal, with interest, calculated generally at five per cent., by monthly instalments, which amount in each year to the sum which would have been payable at the end of that year had the payments been made annually. By this arrangement the Society receives the use of all the repayments for, on an average, $5\frac{1}{2}$ months, and the interest received by re-lending these payments during these months is added to the profits of the Society. If you ask a member of such a Building Society for an explanation of their operations, as you cannot understand how money lent at 5 per cent., with the premiums charged, can ever realise 7 per cent. upon the capital of the Society, you will be told that you underestimate the value of monthly payments, and that it is not only on the $5\frac{1}{2}$ months' interest that they rely, but upon the fact that the same money can be lent and re-lent to different parties in the course of the year, and all of them pay interest on the same money at the same time, while the society has the use of this money actually for nothing, as they are all this time payments made in advance.

This is a very plausible explanation ; but there is an amount of confusion in it, and I will now take the liberty of developing this principle in a practical illustration. Suppose, then that you take a £10 share in one of these Societies—say on the December meeting night, and we will suppose that the financial year of the Society terminates in December. If you pay your share in full you will be entitled next December to receive a dividend of perhaps 7 per cent upon the £10 now invested. But immediately you pay your £10 it is laid out as part of a loan of £1500. In January the borrower returns your £10 as his first monthly instalment, but he continues to pay interest upon it until the end of the year. The £10 returned in January is in like manner given out as part of a loan of £1500

to a second borrower, who returns it as his first instalment in February, and he continues to pay interest upon it also, for 11 months after he has returned it. It is again and again given out and returned, until, at the end of the year, it will be found that twelve borrowers are all paying at the same time 5 $\frac{p}{c}$ cent. per annum for the same £10. Of these, one will have paid for one month, one for two months, and so on up to the party who had it first, who has paid interest on it for 12 months. The addition of this is that there has been interest paid on the £10 for 78 months, or $6\frac{1}{2}$ years, at 5 per cent. per annum, or $32\frac{1}{2}$ per cent. This extraordinary increase is of course realised upon only a part of the money, and upon that only while it is a payment in advance. But as all the money pays 5 per cent. in addition to the premium, this $32\frac{1}{2}$ per cent. upon advance payments, when divided over the whole capital, raises the realised profit to something like 14 per cent. per annum ; and after setting aside a reserve fund and paying all expenses, they can afford to pay 7 per cent. per annum on the invested shares.

This explanation may appear to all present to be extremely absurd ; and so it is—downright nonsense ; but, gentlemen, there is not amongst the members of Building Societies one man in ten who could point out its fallacy. As in the question about the boots, when some one was about arriving at the proper answer, a hint that he had forgotten the boots was sure to set him all wrong again, so here there is always something to set us wrong ; and, after all argument, the prominent fact that a Society has for 12 or 14 years continued to pay 7 per cent. per annum, and its accounts have never been challenged, appears to the investor to be a sufficient guarantee that it will always do so.

The operations of Building Societies are business transactions, and while some of them may be managed with a little sleight of hand, yet as sensible men we must repudiate the

existence of all magic, and examine their pretensions upon the principle that profits can never exceed gains. The repayments of Building Societies are made monthly, and are of the same total amount as if they had been paid in one sum at the end of the year of the mortgage. If we suppose those repayments to be always re-let at the instant they are received, their total value would amount at the end of the year, with compound monthly interest at 7 per cent. per annum, to 1.0332 times the sum of the payments ; at 5 per cent. they would amount to 1.02492. It appears then, at 7 per cent., the advantage of monthly payment is $7\frac{3}{4}$ d. per pound on the total payments for the year ; and at 5 per cent. the advantage does not amount to 6d. per pound ; as the repayments in any one year never exceed 12 per cent. of the whole capital of the Society, it follows, the total advantage which can possibly be derived from monthly payments is an addition of 4-10th per cent. to the annual dividend. But this result can never be attained, as the money must be idle for a great part of that time. This statement is not to be modified by any consideration of its being in several hands at the same time, for it is based upon this circumstance, and unless a borrower be found to take up every fraction of the payments as they come in, this $7\frac{3}{4}$ d. could not be realised. But the statement that the same money is returned over and over again in the course of a year is a false one. The £10 in the illustration given above was not returned on the next meeting night ; it formed the 150th part of that loan, and only the 1-150th part of your share was returned on that evening. On the following evening, another part, equal to 1-150th, was returned by the first borrower, and the second borrower, on the same evening, returned 1-22500th part of your money. If you have a taste for such calculations you can follow this out for a year, and you will find that at 7 per cent., compound monthly interest, you will never make 8d. out of it. I will now go on

to examine the nature of the loans, and the scales by which they are to be repaid.

The scale which is almost universally adopted by borrowers is the 20-year scale, by which £100 is repaid by monthly instalments, amounting to £8 per annum for 19 years, and to £8 18s. 6d. in the 20th year. In many Societies the premium on this scale is only £6 per cent.; that is, the Society pays £94 for certain payments which are to extend over a period of 20 years. It is a loan, not of £100 at 5 per cent., as the scale would indicate, but of £94 at £6.1317 per cent., or £6 2s. 7½d. per cent. per annum. I think I hear some one saying "But it is paid monthly." Let me assure you that unless it was paid monthly, and unless it was also re-let on the evening the payment was made, it would not realise even 6 per cent. per annum. I have calculated the present value of the 5 per cent scales, and have affixed them to this paper with their values at different rates of interest. Those scales in which the total annual payments are equal are valued as annuities.

$V = \frac{1}{R} \left(1 - \frac{1}{(1+R)^n} \right)$ where V is the present value of £1 per annum, R the rate of interest to be realised, being $R=.05$ for 5 per cent., n is the number of years. This formula gives the present value—supposing the payments to be made annually; for monthly payments $\frac{1}{12}$ is added when the rate of interest is 7 per cent. per annum; and $\frac{1}{12}$ when the rate is 5 per cent., and intermediate values for intermediate rates.

For those scales in which the amount of *principal* paid annually is a constant quantity I have constructed the following formula:—

$$V = \frac{1}{R} \left(n r + \frac{R-r}{R} - \frac{R-r}{R(1+R)^n} \right)$$

Where r is to be taken as the rate of interest, on which the scale is constructed, and R is the rate which is to be realised by the loan. This is corrected for monthly interest in the same manner as the other.

If Societies are to pay, they must receive a higher rate of interest than they give to the members. I question if this has ever been the case in Societies lending on the 5 per cent. scales. Almost all the loans are on these scales, and perhaps 90 per cent. of them are on the 20-year scale. Now, as the Societies, as a rule, have been paying 7 per cent. per annum to shareholders, and as in no single instance have they ever received such a premium as would yield them 7 per cent. even under mathematical conditions, and in general have never received more than $6\frac{1}{4}$ per cent., it follows that many of these Societies are at this moment insolvent ; that is, they cannot pay their members 20s. in the pound by selling every mortgage in their possession at their market value, or even at their cost price. The present value of the 20-year scale to yield 7 per cent. per annum is £87 16s. 4d.,—that is, the premium ought to be £12 3s. 8d. ; but instead of this it ranges from £6 to £10.

I have as yet said nothing of entrance-fees and fines. Entrance-fees of themselves ought not to form a part of the profits of a Society ; they ought to remain intact as a reserve fund. They would form, it is true, but a very small reserve fund ; but better small than none at all. There is at present no reserve fund in any permanent dividend Building Society lending on the 5 per cent. scales. A little consideration will show clearly that this is the only equitable allotment for entrance fees. The interest of this fund should form a part of the annual dividend, and the member who remains in the Society reaps the full advantage of his entrance-money. In many of the Societies the entrance-fee has been raised from 1s. to as high as 7s. 6d. per share. There has never been any just ground for this increase—the legitimate source of profit is the borrower, and not the lender. No Building Society has ever been nearer solvency than when it started ; and if members then bought a £10 share in the concern for

£10 1s., there is no just reason why members joining at a time when the shares have depreciated should pay a premium for doing so.

Fines and transfer fees form justly a part of the annual profits. These are supposed to be sources of great profit, but when they are set off against the working expenses, bank commission, and property tax, the balance is generally on the wrong side of the ledger.

If we examine the statement of present values attached to the scales, we find that wherever 7 per cent. per annum is realised on a 5 per cent. scale, the premium is about one-fifth of the total 5 per cent. interest in the column of interest. In one scale this is not the case, but it is not correctly a 5 per cent. scale. It thus appears that the total interest paid by the borrowers is about one-fifth more than what appears in the books as his interest. From this relation we arrive at a very convenient *approximation*, for the use of members of committee, in settling the amount of dividend to be declared. If the loans in any society have all been let to realise under mathematical conditions 7 per cent. per annum, and if the repayments are on a 5 per cent. scale, then the income of the Society from such loans is one-fifth more than the sum entered in the books as interest, and the amount of premium need not appear in the calculation of income. In every case the addition ought to be just that part of the total interest that the premium is of the sum of the interest column in the scale of repayment, added to the proportion of the whole payments allowed for the interest on the monthly instalments, viz., $\frac{1}{5}$ for 5 per cent. But you will again remind me that the repayments are made monthly, and re-lent, &c., and that I lose all that by this rule. Not at all. Add the premium to the interest column, and you do not get 7 per cent. by annual payments; it is only by monthly payments that the 7 per cent. is gained. But in adding one-fifth to the total interest

received for the year, we get a hold of all the monthly interest and profits too, and increase them likewise by one-fifth.

The basis of my reasoning is this:—I look at the amount of premium only to arrive at what is actually lent; for, whatever the rules may say to the contrary, premiums are only *nominal* amounts, and when a transaction at 9 per cent. premium is recorded, it would be equally true, far more correct, and less likely to mislead, to state that £91 only had been lent at 6½ per cent. per annum interest. It is evident that over the whole period of the loan this approximation will adjust itself to be in the long run quite correct. But it is also necessary that in the individual years it should apportion to the then members their fair share of the profits.

I will now take a numerical example, and demonstrate to you that at the outset the members will receive a little more than their fair share by this mode of striking a dividend, and, therefore, that the income derived from loans is never more than is indicated by this approximation.

When £100 is lent on the 5 per cent. scale to yield 7 per cent. per annum, the premium is £12 3s. 8½d., and the sum actually lent is £87 16s. 3¾d.; and what we have now to arrive at is, does one fifth added to the interest received for this £87·8 equal 7 per cent. per annum upon it? Now 7 per cent. upon £87·8 is £6·146. This is the amount to which the approximation should bring the booked interest. The amount of the first year's instalments is £8, but this is increased by monthly compound interest to £8·23; deduct £3 principal, the remainder is £5·23; one fifth of this is £1·046, and this added to £5·23 gives £6·276, so that at the outset at least the members would have no cause to complain, and in the long run the new mortgages would enter along with the old ones, and equalize the differences.

I will now strike the dividend in a few of the reports which are on the table before me. They are numbered, and I take them at random:—

No. 1.—“*The Albion.*” Sixth Report.

INCOME	Interest	£1679	2	8
	Add one-eighth. This supposes a premium of £7 10s. on the 20-year scale.....	209	17	10
	Fines	64	11	10
	Transfers	11	16	9
	Bank Interest.....	102	8	3
				£2067 17 4
EXPENDITURE	Expenses	£119	12	0
	Property Tax	56	0	0
				175 12 0
	Available for dividend	1892	5	4
	× Rate per cent. of dividend paid			7
	÷ Dividends actually paid.....	£2526	19	5
		13245	17	4
	= Rate per cent. of dividend realized		5	4 10½

But instead of adding one-eighth of the total interest, we should add one-eighth of the interest received on this year's *new* mortgages only, as the premiums of all older mortgages have already disappeared from the funds of the society. When this correction is made the realised rate of dividend becomes £4 16s. 2d.

But instead of declaring a dividend at the rate of $4\frac{3}{4}$ per cent., as they ought to have done, the report informs us that, “after paying a dividend at the rate of 7 per cent. per annum, a considerable balance will be carried to next year's account.”

No. 2.—“*The Monarch.*”* Fifth Report.

INCOME	Interest	£1072	5	11
	Add one-eighth (as above)	134	0	9
	Fines	14	18	9
	Transfer	2	4	0
	Bank Interest.....	37	9	9
				1260 19 2
	Expenses		131	1 11
	Available for dividend		1129	17 3
	× Rate per cent of dividend paid			7
	÷ Dividends actually paid	£1590	17 11	7909 0 9
	= Rate per cent. of dividend realized.....		4	19 5
	Corrected for deficiency of reserve balance as in No. 1		4	13 3

* Of these two societies David Lewis, Esq., of the Bank of England is president; and, while correcting the proof sheets of this paper, I observe in

This report shows under $4\frac{3}{4}$ per cent. realized, and 7 per cent. paid.

No 3.—“*The Rock.*” *Sixth Report.*

INCOME	Interest	£1104 14 2
	Add one seventh (I have no information as to the amount of premium), this allows £8 10s. premium on the 20-year scale	157 16 2
	Fines	6 3 0
	Transfers.....	8 7 0
		1277 0 4
Expenses		247 18 1
	Available for dividend	1029 7 3
× Rate per cent. of dividend paid		7
	÷ Dividends actually paid	£1363 6s. 2d.) 7205 10 9
	= Rate per cent. of Dividend realised.....	5 5 9
	Corrected for deficiency of reserve balance	4 19 9

This report also declares a 7 per cent. dividend. I might go on for hours getting similar results. These extraordinary dividends are ruining the Societies, but perhaps you cannot see how. The balance-sheet shows that everything is right, apparently, but the balances due by the borrowers are not payable at the present date, and they are not worth the sums set down for each. The shares of the members no longer exist intact in the funds of the Society; they have been reduced by these imprudent dividends, and are now minus their amount, increased by compound interest, since the date at which they were declared. They do not appear as deficiencies, because the mode of book-keeping in these Societies is a perfect blind as to the true state of the funds. Having studied this subject, I would suggest to all members of Building Societies that they have their stock valued by an actuary, to know exactly how they stand; and after that they ought to enforce that in the Society's ledger only that sum which is actually lent should appear, with interest at the rate of 7 per

to-day's *Mercury* (July 20), that these and other societies have just presented that gentleman with a “very handsome testimonial” in appreciation of his valuable services as president.

cent. per annum. A standard minimum of premium to realise 7 per cent. should be adopted for each scale, and when a higher premium is received it should be divided with next year's profits. While the Society's books are kept in this way, the pass-book of the borrower should be kept as at present, and the two results will always agree. By this method the members would always know how the Society stood, and would not have the excuse of blind ignorance, as at present, for cutting into their capital. The rate to be realized might be fixed at less than 7 per cent., but it should never be less than the rate per cent. taken to pay the expenses and dividends.

Before concluding I must again tell you that I have been only treating of 5 per cent. scales. There are several Societies now working on 6, $6\frac{1}{4}$, or even $6\frac{1}{2}$ per cent. scales, and of course, with these, there is less chance of deterioration, for they actually realise 7 per cent. per annum. There is one set of reports on the table with high rate scales. By one of these tables £100 is lent at 6 per cent. premium, and repaid by monthly payments, amounting to £8 per annum for 25 years, the interest being calculated at $6\frac{1}{4}$ per cent. In the 5 per cent scales the same premium is charged, and the sum is repaid in 20 years also at £8 a-year.

APPENDIX.

When this paper was read before the Society, the Appendix consisted of tables of values of 5 per cent. scales calculated by logarithms; and an analytical investigation of a hypothetical Society realising 7 per cent. dividends. At the request of some Building Society people, I have gone into these details again, using only the rules of common arithmetic, and I find that for any Building Society problem, these rules, properly applied, are all that is wanted. I have in this appendix gone into several of these problems very minutely,

and my object being to make these things better understood than they generally are, I have aimed at plainness in all my statements, and I hope no reader will be disappointed in this respect.

Five per cent. scales are those treated of in my paper, and I will still confine myself to five per cent. scales, as they are those almost universally adopted in Liverpool.

The repayment scales all profess to be correctly calculated, but I find that several of them are a little in error. The 20-year scale has 19 times £8, and in the last year it ought to have £8 16s. and three-eighths of a penny, but this varies from £8 18s. in some societies to £9 4s. in some others. It is necessary that I should notice this, as the result of my calculations, although correct for the scale I give, will not be strictly accurate for the scales which differ from it.

I wish my statements to be tested in every possible way, but in doing so, please to notice that there are also misprints in some of the Societies' tables of scales, as, for instance, in the table which gives £9 4s. as the twentieth payment; the amount remaining unpaid at the end of the 7th year is stated to be £73 15s.; this ought to be £75 11s. 6d.

The most important problem in Building Society arithmetic is the valuation of the outstanding mortgages. This can be done very simply, and to any degree of accuracy, by dividing and adding. The present value of any future payments depends upon the rate of interest in the money market. If you can get 5 per cent. for money, then the present value of a sum of £105 to be paid to you in one year is exactly £100. This is very plain when these are the amounts; but suppose now the future payment to be £296, payable in one year, the present value would be found, by dividing £296 by 1.05, to be £281.905. This is the principle on which present values are calculated. When the rate of interest is 5 per cent. £1 becomes £1.05 in one year, and therefore, we divide the

payment then due by this 1.05 to find how many pounds are the present value of it. In like manner, when the rate of interest is 6 per cent. we divide by 1.06, when 7 per cent. we divide by 1.07, and when $6\frac{1}{2}$ per cent. we must, of course, divide by 1.065. When the sum is to be paid in two years we divide twice by this divisor: that is, we first divide the sum by 1.07, if for 7 per cent., and then we divide that quotient also by 1.07; and this division must be made just as many times as there are years to elapse before the payment falls due.

When there is a number of future payments falling due at different periods, we must begin with the last payment first, find what will be its value when the payment preceding it is due, and add that value to this payment; then find the value of this sum when the next preceding payment is due, and add, and so on, until the present value of all the payments is found.

By a simple device we can very much reduce the labour of this calculation. As the rate of interest is the same through it all, the same divisor will be used throughout. On a slip of paper write the products of this divisor by each of the nine digits as under—

$$\begin{array}{c|c|c|c|c|c|c|c|c} 1.07 & | & 2.14 & | & 3.21 & | & 4.28 & | & 5.35 & | & 6.42 & | & 7.49 & | & 8.56 & | & 9.63 \\ 1 & | & 2 & | & 3 & | & 4 & | & 5 & | & 6 & | & 7 & | & 8 & | & 9 \end{array}$$

Let the products be at the upper edge of the strip. In calculating present values this strip is placed by the left hand with the products under the dividends, or under the remainders, leaving a space between on which to write the new remainder, and in this way all the multiplication is saved, and the operation is reduced to one of addition and subtraction only, and the risk of error is lessened.

In illustration of this method I have introduced an example in Table I. It is the calculation of the 20-year 5 per cent. scale. The annual payments are £8 until the last year, when

the payment is £8.80161 or £8 16s. and a fraction of a penny. The value is taken at 7 per cent. per annum, and the strip used is that given above. The figures running diagonally are the remainders found in performing the divisions, and are reproduced here to show exactly what is meant.

The last year's payments amount to £8.80161; this is written down as shown, and the quotient found by dividing it by 1.07 is written in the following column, but one line higher. The other payments being exactly £8 the addition can be performed without writing the £8; this is done, £8 added to 8.2258 gives 16.2258 which is also divided by 1.07. The quotient now reached is 15.1643, which is evidently the correct value of the payments of the 19th and 20th years, if purchased at the beginning of the 19th year, or what is the same thing at the end of the 18th year, if the rate of interest be 7 per cent., supposing the payments to be annual payments, but as the sums are paid up by monthly instalments they are of greater value. If the monthly payments could all be let at 7 per cent. on the same night on which they were paid in, then we should allow 7 per cent. compound interest upon them, and this would amount to one-thirtieth of their sum. I have done so in the 7 per cent. calculations given in my paper, but in practice these odd payments do not realise on an average even 5 per cent. One pound paid by monthly instalments, 1s. 8d. per month, will increase by lending the instalments, at 5 per cent. compound monthly interest, to 20s. 6d. at the end of the year. This is one-fortieth more than the pound itself. At simple interest, it would have amounted to 20s. 5½d., but as one-fortieth is more easily reckoned, I will adopt it in the following calculations. In allowing for monthly payments in this way it is a matter of no consequence whether each payment is increased and then the whole valued as annual payments of the increased amounts, or that the payments are taken at their nominal amounts, and the addition be made to

the value arrived at. In the given example I have followed the latter course. The second line is the addition to be made for the interest for the odd months. It is found by dividing the third line by 40, or by 4 placing the quotient one place to the right hand. The second and third lines added give the top line which is the redemption value of the outstanding balance at the beginning of the respective years. (See Table I.)

I wished to shew these lines separately or I would have taken the other plan and increased the annual amounts at once by one-fortieth, and saved these two lines, adding at each column £8.2 instead of £8.

There are several methods for approximating to the present values, but they do not come near enough to the truth, and the value of the error on £100 will always pay for working it out correctly.

Table II contains the most important of the calculations connected with the 20-years 5 per cent. scale of equal repayments. The first column gives the number of the year from the beginning of the mortgage. The balances of the mortgage, and their values all refer to the *beginning* of the year. This is different from the arrangement of the scales in Building Society tables, and the reader must bear this in mind in referring to this table. This arrangement is the proper one for my purpose, as it brings in one line the principals and their corresponding interests, and otherwise I would have had another line in the tables, which line I would have been under the necessity of making No. 0, to avoid the pedantry of calling it the zero line. (See Table II.)

Column No. 2 contains the balance of mortgage at the beginning of each year. These balances are given in a decimal form, and are calculated correctly as a 5 per cent. scale ; they do not exactly agree with the tables of any Society, but they do not differ much from some of them.

Column 3 contains the interest paid during the year on the balance due at the beginning of that year.

Column 4 contains the principal repaid during the year to lessen the balance due at the beginning of that year.

Column 5 contains the value of the balances owing at the beginning of the year to realise 7 per cent. per annum. This column is for annual payments. These are a repetition in a tabular form of the values arrived at in Table I.

Example. A mortgage for £568 has run 10 years; what is the present value of the remaining payments? At the beginning of the 11th year the value of these payments for £100 of the original sum is 56·59613; this, multiplied by 5·68, gives £321·466, or £321 9s. 4d. for the present value for annual payments.

Column 6 is the same as column 5, but is for monthly payments. It allows 5 per cent. compound monthly interest on the monthly instalments. The first line of this column tells us that to realize 7 per cent. a Building Society ought to pay only £87·0768 or £87 1s. 6½d. for a mortgage of £100 on the 20-years scale. That is, there should be a premium of £12 18s. 5½d. This allows for monthly payments, but supposes the mortgage to run on to the end of the twenty years.

Column 7 is the same as column 6, but it gives the value in per centage of the nominal balance, whereas columns 5 and 6 give the value in per centage of the original loan.

Columns 8, 9, and 10 are similar to columns 5, 6, and 7, but are calculated to realise 6 per cent. to the purchaser. (See Table III.)

Table III is an extension of Table II, showing the effect of a certainty of redemption at the end of the 10th year on an average of all the mortgages. It is not within the scope of this paper to criticise the propriety of valuing outstanding mortgages on this principle. It has been affirmed by practical Building Society men that this is the proper basis on which to establish our calculation, and therefore I have

worked out the problem also in this form. It is shewn in column 1 that the premium necessary to yield a 7 per cent. annual dividend is £10 15s. $2\frac{1}{2}$ d. This is found by subtracting £89.2397 from £100. And in like manner the premium to realise 6 per cent. is £4 17s. $7\frac{1}{4}$ d. The difference in the amount of premium is not so great as has been imagined. Some have taken the very simple rule of considering that the mortgage having only half the time to run, half the premium would be equivalent to the full premium to run the full 20 years. But instead of being 50 per cent. it is 83 per cent. in the 7 per cent. column, and 86 per cent. in the 6 per cent. column. From this it would appear that one-fifth added to the premium received when that premium is £10, and one-sixth when it is £5, will give the equivalent premium to run the full 20 years.

In the reports examined in this paper, I took the premium at £7 10s. per cent., but they did not exceed £6 per cent., so that I allowed about 10s. too much premium even if all the mortgages were to run only ten years. (See Table IV.)

As it is generally supposed that Building Societies are only dividing what is just and proper, and that if they divided less the accumulated profits would become so large that future members would not know what to do with them, I have gone into this question somewhat extensively, and in Table IV I have given the financial history of a Society working without expense and also without fines. This Society I have supposed to lend exactly £10,000 per annum. That is, the *mortgages* are £10,000 per annum ; what the capital advanced is depends upon the amount of premiums received ; but this does not affect in any way the items in the first six columns. From the second and third columns we get the rate of increase of the Society necessary to enable it to lend the same amount every year. The increase becomes less every year, until in the 20th year the point is reached when the income can just

pay the dividend and furnish the money required to advance £10,000, whatever be the premium charged. I have, of course, supposed the premium to continue of the same amount throughout the 20 years, and I have given the state of the funds first on a 7 per cent. dividend, and then on a 6 per cent. dividend.

The last year's income is £16,482 ; the 7 per cent. dividend is £7,773, and after paying it there is a balance of £8,709, which, to realise 7 per cent. must be lent at £12.923 premium, therefore £8,709 would be lent as £10,001 6s., and the Society could go on for ever lending this amount per annum without adding to its capital account. We have now £1 6s. more lent each year ; this slight increase is caused by the increase on the payments in the last year of the scale.

In the same way we may examine the termination of the 6 per cent. column ; there is a balance of £9,431 after paying the dividend, and this to realise 6 per cent. will just lend for £10,001 1s.

To approximate to the proper amount of dividend is one of the most important problems in connexion with Building Societies. I have already given a rule for this approximation, and in columns 9 and 13 the results by that rule are placed side by side with the correct amount of dividend. The closeness of the approximation is sufficient for any practical purpose. In applying it to an actual society, the approximation would be still nearer to the proper dividend, for any error in one year would have the effect of improving the degree of approximation in the following year.

Now, here is a Society that has always lent at the full premiums, and has never divided more than the proper dividend, and yet we find no unwieldy balance of undivided profits at the end of 20 years. The difference between the nominal amounts of the mortgages and the capital has been getting relatively less instead of greater. It is easy to see by this

table the folly of dividing all the premiums as they come in. As the amount lent each year by this Society never varies, the premiums are also always of the same amount ; but in the first year, had they been divided, they would have been shared by members representing only £10,000 of mortgages, but in the 20th year they would be divided among members representing £121,604 of mortgages ; and it must not be supposed that the circumstance of its being limited in its action is against the Society, for this Society has no expenses, and therefore the extent of its operations can never affect its proportion of profits. It may be objected to this that actual Societies gain by fines and transfers more than the expenses of the Society. It is not the case. Occasionally there may be a year in the history of a Society in which this is true, but it is very far from being the rule.

The 10th and 14th columns of this table are, perhaps, the most important of them all. They tell us what ought to be the amount of capital corresponding with a given amount of mortgages. A little inspection of the past reports of a Society will enable you to fix its average age to correspond with this table. If its annual lendings have been becoming less, then its age should be taken at more than the actual age of the Society ; if they have been increasing, its age should be taken at less than the actual age. In a Society whose age is, say 6 years, and the dividend 7 per cent., the capital, whether the shares of the members or borrowed money, should be only 88.65 per cent. of the total mortgages. That is, at 7 per cent. the whole debts would only fetch 88.65 per cent. of the mortgage balances. (See Table V.)

Table V is an extension of Table IV, supposing the mortgages to be all redeemed at the end of 10 years, although they were originally contracted for 20 years. The heading of the columns, coupled with the preceding remarks on Table IV, will be all that is necessary to make it understood.

It gave me great pleasure to find by one report that the balance of undivided profit in that Society was "about 12 per cent. of the capital stock." I have examined that report to learn how they managed to pay 7 per cent. and yet have such a balance. The Society is called the "Everton and West Derby," and I refer to their report for the year ending May, 1863.

The paid-up Shares amount to	£65,327
Borrowed Money	9,743
<hr/>	
Working Capital	75,070
Balance of undivided profit	5,300

Now, I cannot make 12 per cent. out of this by any plan. I have come to the conclusion that they are comparing this balance with the amount of paid up shares, but it ought to be compared with the total capital. But how is it 12 per cent. even of that? Well, it is about one-twelfth of it, and perhaps that is what is meant, but they in future should say what they mean, as there is a great difference between one-twelfth and 12 per cent. The report of this Society is a very instructive one. In this paper I have not worked in the property tax nor the bank commission. I find that the expenses, bank commission, and property tax, amounted to £567, while the fines, transfers, and forfeitures amounted to £250, so that this Society for that year is £317 out of pocket by management account. In Tables IV and V I have not introduced the working expenses at all, and the money is supposed never to lie in hand, so that in comparing actual Societies with this table an allowance should be made for these. This allowance would quite equal the difference to be made for redemption at the end of 10 years, therefore, instead of working by Table V, we would be nearer the truth to work by Table IV, even with certainty of redemption in 10 years. The "Everton and West Derby" is certainly not of greater average age than an eight year Society in Table IV, and to pay 7 per cent. it should therefore

have a balance of undivided profit equal to 10·82 per cent. of the mortgages, that is just about what the report states, 12 per cent. of the capital.

But it should also be remembered that this Society has, in declaring 7 per cent. actually paid $7\frac{1}{2}$ per cent., for the £317 referred to above had also to be paid out of the profits. After apportioning the income, as it ought to be as nearly as the report will enable us to do it, and leaving some margin to be sure to be above rather than under in the result, it appears that this Society did not realise more than $5\frac{1}{3}$ per cent. in the year referred to. In this day's *Mercury* this Society advertises for money on loan at 6 per cent. interest. As long as the members get seven per cent. they will not object to borrowing on preference shares, but the ordinary members will find it rather awkward should a certain point be reached, and the dividends come down to 5, or even to 4 per cent., and no withdrawals can be paid until the loans are cancelled. The ninth report of the "Second Monument" should be studied by all members of borrowing Societies.

It has been objected to my statements that Societies are large borrowers of money at 5 per cent. My answer is, so much the worse for societies as they are at present, and besides, it is illegal for them to borrow at all. In striking the dividend by my rule the effect of borrowed money is justly taken into account, and the dividend gets the full advantage of it if there is any. The objectors do not tell us that they are also large borrowers of money at the bank discounting rate. So much do they depend upon premiums that they will not hesitate sometimes just before a report is issued to borrow from the bank on a promissory note at 8 per cent. to get the premium for the re-lending of it into the report.

The Borough Building Society, Ninth Report.

It has been objected by the promoters of the "Borough" that I have chosen the worst Societies, and that theirs is in a

much better financial position. They are willing that it should be publicly examined, and, in justice to them, I will now do so.

In this and in several other Societies we meet with a form of balance-sheet which ought not to be adopted, as it blots out entirely the little information there is otherwise found in Building Society reports, and is a violation of the rule on profits. The interest paid by the Society for money on loan does not appear as an item of expenditure at all. There is an entry on the creditor side, "By interest," which ought to represent the total interest received on outstanding mortgages; but instead of that, it is actually the balance remaining after deducting the sums of interest paid by the Society for the money it has borrowed. In the report of one Society I find, "By interest £386;" but on enquiry I am informed that the interest actually received was £1,037, and that £651 had been paid to the bank for interest, leaving the balance £386. Members of societies should insist on these amounts being clearly and separately stated in every report. Without further information my rule of approximation to dividend cannot be applied to such reports. On application I was informed that the total interest received on mortgages was, in the last year of the Borough, £4,604. In the report we have, "by interest £4,252," the difference, £352, was paid as interest on loans.

In valuing this Society I think it will be fair to discount the mortgages at $6\frac{1}{2}$ per cent., because their premiums are high, and to give it the benefit of redemption in ten years, because they claim it, and to compare it with Table V as a Society in its sixth year, because although actually in its tenth year, its mortgages amount to £93,413; but £30,676 was advanced last year, £27,900 in the preceding year, and £19,500 in the fifth year—I have no more reports. This indicates that the majority of the mortgages are of recent

creation, and it may be safely compared with the sixth year of table V. This table gives 6 per cent., and 7 per cent. values only; $6\frac{1}{2}$ per cent. would be nearer 7 than 6. We will take it midway, and thus give the Society the benefit of the error. The value of the mortgages will by this estimate be 93.63 per cent. of the nominal balance.

The liabilities of a Society are the sums paid up on shares together with its debts. The assets should cover these, and should also include a reserve fund equal to the entrance fees on the paid up capital; that is, in the Borough, where the entrance fee is 10s. on an £18 share, there should be a reserve fund equal to 10s. on every £18 in the subscribed capital. The interest of the entrance fees helps the dividend, and when shares are withdrawn the entrance fees on them are taken from the reserve, and are divided with the profits.

When money is lent on a 5 per cent. scale to yield $6\frac{1}{2}$ per cent. per annum, my approximation is to add .15 of the booked interest to the interest for the sum of the profits, and as this .15 of the interest is taken from the premiums, this is meant to be the fair proportion of the premiums that should be applied to increase the dividend for that year. This .15 is one-tenth of the difference between the rate of the scale and the rate realised by the loan, and this is the rule of the approximation. For 7 per cent. take 5 from 7 leaves 2, divide by 10 gives .2 or one-fifth.

If the mortgages to be valued exceed the liabilities and reserve by the proper amount of discount, this increase of interest should be made as above. But if there is only an excess equal to one-half of the proper discount, then only one-half of this increase should be allowed, and so on.

With these explanations, the following statement of the financial position of the "Borough Building Society" will be intelligible:—

Liabilities	Subscriptions on Shares ..	£74,639
	Entrance-fees on above ..	2,073
	Borrowed Money and debts	8,003
	Dividend due—say	4,500
		<hr/>
	Purchase value of mortgages	89,215
		<hr/>
	Equivalent mortgages	95,284
	Deduct.....	89,215
		<hr/>
	Proper amount of discount	6,069
		<hr/>
		4,198 actual discount.
		·15
		<hr/>
		20,990
		4,198
		<hr/>
	6069)	62,970
		<hr/>
	Addition to be made to interest....	·104
		<hr/>
	Total interest received.....	£4,604
	Add ·104 of the same	479
		<hr/>
	Total usury	5,083
	Fines, transfers, rules, forfeitures	187
		<hr/>
	Total revenue	£5,270
	Interest paid.....	352
	Expenses, property tax, commis- sion and rates	446
		<hr/>
	Total expenditure.....	798
		<hr/>
	Available for dividend	£4,472
	Rate of dividend paid	7
		<hr/>
	Amount of dividend paid.....	£5,060)
		31,304
		<hr/>
	Rate of dividend realised.....	6·186 per cent.

This is a result much better than I anticipated. There is a deficiency of £1,871 in the discount, but as I started with a dividend amounting to £4,500, and arrived at an available dividend of only £4,472, this reduces the deficiency to £1,842. But again, as they declared a dividend amounting to £5,060 instead of £4,472, this increases the deficiency to £2,430.

From this statement, which is only an approximation, it appears that this Society is in a very favourable position ; it is the only Society I have found realising this dividend. It

would fetch 20s. in the pound if sold to yield $6\frac{1}{2}$ per cent. to the purchaser, supposing the payments to be gathered in without expense, and that on all mortgages there was certainty of redemption in ten years. The reader may think there is something wrong with it because I have used so many figures to arrive at this result ; the most of the calculation has to do with the discount on the mortgages, but in the three societies first examined, the discount is easily dealt with, for there is none, the premiums having been all divided as they came in.

This method of calculation is only an attempt to arrive at the valuation of the actuary without having access to the books of the Society. Were the books open to me it would be an easy matter to arrive at the correct valuation.

I would suggest to those on whom the responsibilities of Building Society management rest that it would not be difficult to construct a *mechanical actuary*. A set of ivory scales, divided logarithmically, as in the common slide rule, but finely divided and of a good size to enable the figures to be read off, and constructed specially for Building Society scales, would enable the auditors to read off the values of all the mortgages in a few hours with sufficient accuracy. One set of scales might be used for all the Societies in Liverpool, and they could well afford to pay for first-class workmanship on it. I have gone into the details of the construction of such an instrument, and I can see no obstacle in the way.

I conclude with a notice of the "Second Monument," a Society which I have named in my notice of the "Everton and West Derby."

The "Second Monument" is a Society now in its tenth year. It has passed through the phases in Building Society existence more rapidly than most of the other Societies. There has been nothing abnormal in its experience, but only a more rapid development, or, in other words, it has flourished more than they. It has paid high dividends—the same as,

or even higher than other Societies, but now it pays only 4 per cent. The following is an extract from its last report :

“ The Committee have again to regret the continuous withdrawals during the past twelve months. They hope the members will exert themselves to obtain new shares for the Society, that the profits may be increased by Premiums on Sales. If such exertions are not made, the present rate of dividends cannot possibly be increased, if they are even maintained.

“ WITHDRAWALS.

“ No Withdrawals will be paid until the Loans now owing by the Society are paid off.”

TABLE I.

END.	20	19	18	17	16	15
Year from the commencement						
Value of Mortgage at beginning of ea. year..	8.43265	15.54331	22.19010	28.40196	34.20744	39.63311
Value of the Interest for the odd months ..	20565	37901	54122	63273	73433	86666
Value exclusive of Interest for odd months..	8.22580	15.16430	21.64888	27.0423	33.37311	38.66645
880161	16.22580	23.16430	29.64888	35.70623	41.37311	46.63645
21	552	176	824	360	927	386
276	175	694	758	399	713	656
621	688	523	988	782	711	144
860	460	950	250	333	691	375
4	320	940	360	120	490	540
				130	620	50
Year from the commencement						
14	13	12	11	10	9	8
44.70384	49.44283	53.87180	58.01103	61.87946	65.49482	68.87366
1.04034	1.20519	1.31394	1.41490	1.50325	1.59743	1.67984
43.61350	48.23691	52.55786	56.59613	60.37021	63.89739	67.19382
51.61350	56.23691	60.55786	64.59613	68.37021	71.89739	75.18382
881	273	705	396	417	769	283
253	596	637	751	960	207	698
395	619	1028	230	1042	1003	562
740	841	656	160	791	409	270
980	920	140	420	420	880	560
170	640	330	990	990	240	
Year from the commencement						
7	6	5	4	3	2	1
72.02188	74.97371	77.73244	80.31070	82.72028	84.72229	87.07682
1.75663	1.82862	1.89591	1.95880	2.01737	2.07249	2.12382
70.25725	73.14509	75.83653	78.35190	80.70271	82.89973	84.93300
78.26925	81.14509	83.83653	86.35190	88.70271	90.89973	...
336	624	893	751	310	529	
155	895	376	290	962	1019	
482	390	555	760	1067	567	
545	699	203	110	1041	323	
1000	570	960	780	780	310	

TABLE II.

The Twenty-years' Scale of Repayments, £8 per annum for nineteen years, and £8 16s. on the twentieth year.

1	2	3	4	5	6	7	8	9	10
YEAR.	Balance of Mortgage at beginning of each year.	Interest paid during the year.	Principal paid during the year.	Value of Mortgage balance at 7 per cent., without Interest on Monthly Instalments.	Value of Mortgage balance at 7 per cent., including 5 per cent. Interest on Monthly Instalments.	Value of £100 of the balance at 7 per cent., including 5 per cent. Interest on Monthly Instalments.	Value of Mortgage balance at 6 per cent., without Interest on Monthly Instalments.	Value of £100 of the balance at 6 per cent., including 5 per cent. Interest on Monthly Instalments.	Value of £100 of the balance at 6 per cent., including 5 per cent. Interest on Monthly Instalments.
1	100	5	3	84 95300	87 07682	87 077	92 00927	94 30950	94 309
2	97	4.85	3.15	82 89973	84 97222	87 600	89 52983	91 76207	91 600
3	93.85	4.6925	3.3065	80 70271	82 72028	88 141	86 90162	89 07416	94 911
4	90.5125	4.5271	3.4728	78 35190	80 31070	88 699	84 11572	86 31862	95 295
5	87.0696	4.3535	3.6465	75 83633	77 73244	89 275	81 16267	83 19173	95 517
6	83.4231	4.1711	3.8189	73 14509	74 97371	89 872	78 03243	79 98324	95 876
7	79.5942	3.9797	4.0203	70 26525	72 92188	90 487	74 71438	76 58224	90 216
8	75.5739	3.7787	4.29213	67 19382	68 87366	91 120	71 19725	72 97718	96 565
9	71.3526	3.5676	4.4324	63 89739	65 49482	91 775	67 46909	69 15581	96 921
10	66.9202	3.3460	4.6540	60 37021	61 87946	92 457	63 51724	65 10517	97 288
11	62.2662	3.1133	4.8867	56 59613	58 01103	93 165	59 32828	60 81149	97 662
12	57.3795	2.8689	5.1311	52 55786	53 87180	93 886	54 88798	56 26018	98 048
13	52.2184	2.6124	5.3876	48 23691	49 44283	94 631	50 18126	51 43579	98 445
14	46.8908	2.3430	5.657	43 61350	44 70384	95 395	45 19214	46 32194	98 847
15	41.2038	2.0602	5.9398	38 66645	39 63311	96 187	39 90367	40 90126	99 265
16	35.2640	1.7632	6.2368	33 37311	34 20744	97 003	34 29790	35 15535	99 691
17	29.0272	1.4513	6.5147	27 70923	28 40196	97 846	28 35578	29 06468	100 124
18	22.4785	1.1239	6.8761	21 64888	22 19010	98 718	22 05713	22 60856	100 578
19	15.0224	7801	7.2199	15 16430	15 53331	99 622	15 38056	15 76507	101 045
20	8.3825	4.191	8.3825	8 22580	8 43265	100 651	8 30340	8 51098	101 533

TABLE III.

The Twenty-years' Scale, but with redemption at par at the end of the 10th year. 5 per cent. Monthly Instalment Interest included.

At beginning of Year.	To REALISE 7 PER CENT.		To REALISE 6 PER CENT.	
	Value of Balance of a Loan of £100.	Value of £100 of the Balance.	Value of Balance of a Loan of £100.	Value of £100 of the Balance.
1	89.2397	89.239	95.1216	95.121
2	87.2865	89.986	92.6230	95.488
3	85.1965	90.779	89.9868	95.884
4	82.9604	91.626	87.1860	96.293
5	80.5676	92.532	84.2171	96.724
6	78.0074	93.508	81.0701	97.179
7	75.2679	94.565	77.7343	97.663
8	72.3476	95.731	74.1985	98.179
9	69.2114	96.998	70.4504	98.734
10	65.8562	98.410	66.4775	99.338
11	62.2662	100.000	62.2662	100.000

TABLE V.

The Working of a Society for Ten Years, lending £10,000 per Annum on the Twenty-years' Scale as in Table IV., but with redemption at par at the end of the tenth year, 5 per cent. interest on the monthly instalments is included. The first six columns of Table IV. can be taken with this table for the ten years.

At beginning of Year.	To REALISE 7 PER CENT.		To REALISE 6 PER CENT.	
	Value of total outstanding Mortgages.	Value of £100 of that Balance.	Value of total outstanding Mortgages.	Value of £100 of that Balance.
1	8,924	89.24	9,512	95.12
2	17,653	89.60	18,774	95.30
3	26,172	89.98	27,773	95.49
4	34,468	90.37	36,492	95.68
5	42,525	90.77	44,913	95.87
6	50,326	91.19	53,020	96.07
7	57,853	91.61	60,794	96.27
8	65,087	92.05	68,214	96.48
9	72,008	92.50	75,259	96.68
10	78,594	92.97	81,906	96.89
11	84,821	93.46	88,133	97.11

Becomes uniform after the tenth year.

TABLE IV.

The Working of a Society for Twenty Years, lending £10,000 per annum on the Twenty-years' Scale of Equal Repayments.

YEAR.	1	2	3	4	5	6	7	8	9	10	IF TO REALIZE SEVEN PER CENT.			IF TO REALIZE SIX PER CENT.						
											Total Principal Repaid.	Total Interest.	Balance of Total Mortgages.	Total Income.	Value of Mortgages at beginning of year.	Correct Dividend.	Dividend by adding $\frac{1}{10}$ th to Interest.	Value of Mortgages at beginning of year.	Correct Dividend.	Dividend by adding $\frac{1}{10}$ th to Interest.	Value of £100 of the Balance.	Value of £100 of the Balance.
1	10,000	10,000	820	520	300	8,707	609	624	87,07	9,430	565	573	9430	9445	9430	9445	573	573	9430	9445
2	9,700	19,700	1,640	1,025	615	17,204	1,204	1,230	87,33	18,607	1,116	1,127	18,607	18,665	18,607	18,665	1,127	1,127	18,607	18,665
3	9,385	29,085	2,460	1,514	946	25,476	1,783	1,817	87,60	27,514	1,650	1,665	27,514	27,584	27,514	27,584	1,665	1,665	27,514	27,584
4	9,054	38,139	3,280	1,987	1,293	33,508	2,345	2,384	87,85	36,136	2,168	2,185	36,136	36,204	36,136	36,204	2,185	2,185	36,136	36,204
5	8,707	46,846	4,100	2,442	1,658	41,281	2,889	2,930	88,12	44,455	2,667	2,686	44,455	44,523	44,455	44,523	2,686	2,686	44,455	44,523
6	8,342	55,188	4,920	2,879	2,041	48,778	3,414	3,455	88,38	52,453	3,147	3,167	52,453	52,521	52,453	52,521	3,167	3,167	52,453	52,521
7	7,959	63,148	5,740	3,207	2,443	56,980	3,918	3,950	88,65	60,112	3,606	3,627	60,112	60,180	60,112	60,180	3,627	3,627	60,112	60,180
8	7,557	70,745	5,560	3,695	2,865	62,868	4,400	4,420	88,91	67,409	4,044	4,064	67,409	67,477	67,409	67,477	4,064	4,064	67,409	67,477
9	7,135	77,840	7,380	4,072	3,308	69,417	4,869	4,886	89,18	74,325	4,459	4,479	74,325	74,393	74,325	74,393	4,479	4,479	74,325	74,393
10	6,692	84,532	8,200	4,426	3,774	75,605	5,292	5,311	89,47	80,835	4,850	4,869	80,835	80,903	80,835	80,903	4,869	4,869	80,835	80,903
11	6,226	90,759	9,020	4,757	4,263	81,406	5,698	5,709	89,69	86,917	5,215	5,233	86,917	86,985	86,917	86,985	5,233	5,233	86,917	86,985
12	5,738	96,497	9,840	5,064	4,776	86,793	6,075	6,078	89,94	92,543	5,552	5,571	92,543	92,611	92,543	92,611	5,571	5,571	92,543	92,611
13	5,225	101,722	10,660	5,346	5,314	91,738	6,421	6,416	90,18	97,686	5,861	5,880	97,686	97,754	97,686	97,754	5,880	5,880	97,686	97,754
14	4,686	106,408	11,480	5,600	5,880	96,208	6,734	6,720	90,41	102,318	6,139	6,160	102,318	102,386	102,318	102,386	6,160	6,160	102,318	102,386
15	4,120	110,528	12,300	5,826	6,174	100,171	7,012	6,989	90,62	106,409	6,384	6,409	106,409	106,477	106,409	106,477	6,409	6,409	106,409	106,477
16	3,526	114,054	13,120	6,022	7,098	103,592	7,251	7,227	90,83	109,924	6,595	6,625	109,924	109,992	109,924	109,992	6,625	6,625	109,924	109,992
17	2,902	116,357	13,940	6,187	7,533	106,432	7,460	7,425	90,99	112,831	6,769	6,806	112,831	112,900	112,831	112,900	6,806	6,806	112,831	112,900
18	2,247	119,205	14,760	6,320	8,440	108,651	7,605	7,584	91,15	115,091	6,903	6,952	115,091	115,160	115,091	115,160	6,952	6,952	115,091	115,160
19	1,560	120,765	15,580	6,418	9,162	110,761	7,714	7,701	91,26	116,668	7,000	7,060	116,668	116,736	116,668	116,736	7,060	7,060	116,668	116,736
20	838	121,604	16,482	6,480	9,920	111,049	7,773	7,776	91,32	117,519	7,051	7,128	117,519	117,588	117,519	117,588	7,128	7,128	117,519	117,588

Becomes uniform after 20th year.

ELEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, 21st March, 1864.

JAS. A. PICTON, Esq., F.S.A., PRESIDENT, in the Chair

Mr. MOORE exhibited a fine stuffed specimen of the Sword-fish (*Xiphias gladius*), recently added to the Derby Museum. It measured nine feet in length, and was taken in October, 1862, by some men in the employment of Mr. Wiseman, oyster merchant, in a small creek near Pagglesham, a few miles from Southend, Essex. It was floundering about apparently in an exhausted state. A short notice of its capture is printed in the *Zoologist* for December, 1862, p. 8289.

Mr. TURNER exhibited from the Museum of the Royal Institution a portion of the hull of a ship, in which was imbedded the sword, or *gladius*, of a fish of this family, apparently of the genus *Histiophorus*.

The PRESIDENT pointed out the special adaptation of the form of the body and tail of the fish for rapid progress through the water, and for producing the momentum necessary for such effects as that shewn by the piece of timber exhibited by Mr. Turner, and of which several examples are known.

Mr. MOORE also exhibited the first portion of a collection of specimens of marine zoology, made during the voyage, just completed, from Liverpool to Shanghai and back, by Captain F. E. Baker, ship *Niphon*, an Associate of the Society. The entire collection, contained in upwards of fifty bottles, had been most kindly presented to the Derby Museum by Captain Baker. It consists chiefly of the smaller and more minute forms of marine life, which though often occur-

ring in considerable abundance, are so rarely collected and preserved. The specimens exhibited consisted of two species of *Janthina* and their rafts, a beautiful specimen of a rare Cephalopod, *Branchia scabra*, two species of *Velella*, a beautiful little *Physalia*, or Portuguese "man of war," several species of *Erichthys*, &c. Additional specimens will be exhibited at future meetings of the Society, and a more detailed list given, accompanied by the notes of Captain Baker.

A paper was then read :—

ON THE CHARACTER OF HAMLET, HAVING
ESPECIAL REFERENCE TO HIS TREATMENT
OF OPHELIA.

BY P. H. RATHBONE, ESQ.

TWELFTH ORDINARY MEETING.

ROYAL INSTITUTION 4TH APRIL 1864.

JAS. A. PICTON, Esq., F.S.A., President, in the Chair.

Mr. F. ARCHER, Jun., exhibited some beautifully preserved specimens of the larvæ of butterflies and moths, prepared by Mr. Baker at Cambridge. The life-like appearance of these specimens attracted considerable attention. He stated that these were the first of the kind which had been seen in this country, and he read a passage from the *Zoologist* for 1856, in which Dr. Collingwood had described the process by which they were prepared.

Dr. COLLINGWOOD said he had been struck by the exhibition of such objects in the Imperial Cabinet of Zoology in Vienna, in 1855, and was informed by the director, Herr Redtenbacher, of the method of preparation employed, which he had afterwards communicated to the Entomological Society. It did not appear that until now any English entomologists had attempted the preparation of such insects, which was a difficult operation; and he hoped that the present specimens would be added to the Free Public Museum.

Mr. PICTON added that he thought he might say that such would be the case.

The Rev. H. H. HIGGINS exhibited some completely fossilised fragments of bones, apparently of large animals, which he had found in a gravel pit by the river Ouse, at Biddenham, near Bedford. They were taken from a place near which a flint implement had been discovered a short time before, at the bottom of a bed of sand about eleven feet below the surface of the soil.

A paper was then read, entitled:—

A NOTICE, BY MR. OLIVIER BEAUREGARD, OF
THE COLLECTION OF EGYPTIAN ANTIQUITIES
MADE BY DR. GODARD, AND PRESENTED TO
THE MUSEUM OF BORDEAUX IN 1862.

BY WILLIAM UNWIN, ESQ.

This paper was an analysis of Mr. Beauregard's book, which consists of an account of the labours, fatigues, sufferings, and death of that devotee of science, in Egypt and Palestine, whither he had gone on a scientific mission from the French Government to study diseases peculiar to those regions; also, a description of Dr. Godard's collection of objects of archæological interest, and which consists of—Stèles, or funereal tablets; papyri; mythological figures, and emblems of the religion of the Egyptians; funereal statuettes; Scribes' pallettes; fragments of mummies and bandages; tokens and coins of Greco-Romanic times; objects from Modern Egypt, such as vestments worn by ladies of the harem, and an account of their religious emblematical signification. Mr. Beauregard's opinion was, that the Egyptians had, behind all their idols, emblems, and symbols, a much purer religion than hitherto they have credit given them for. He believed that the Christian religion itself, if judged of from the material diagnosis it presents when studied in the sculptures of our temples (Notre Dame of Paris, for example), pictures, and statues, would be seriously misinterpreted. The paper concluded with an imaginary report which might be made by a commission of the Institute of a nation to arise 4,000 years hence, and which, after obtaining a key to the French language, had come to France to study from the sculptures, &c., in the temples, the religion, morals, and manners of the French.

A second paper was also read, entitled :—

THE GOOD OLD TIMES.

BY D. BUXTON, ESQ., F.R.S.L,

THIRTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, 18th April, 1864.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

Messrs. Hermann Fischer and Joseph Burne were balloted for, and duly elected ordinary members.

Mr. MOORE exhibited several interesting specimens of animals lately added to the museum, including an example of the Bohemian Waxwing (*Bombycilla garrula*), lately obtained in the neighbourhood ; and also several curious marine worms and entomostraca.

A paper was then read :—

ON THE PRINCIPLE OF EQUALITY IN DIRECT
TAXATION.

BY A. COMMINES, LL.D.

FOURTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, 2nd May, 1864.

J. A. PICTON, F.S.A., PRESIDENT, in the Chair.

It was announced that the Annual Dinner of the Society would be held some time about the end of the present month, at a time and place to be arranged by the Committee.*

Dr. J. E. Gray, F.R.S., of the British Museum, and Professor Rolleston, F.R.S., of Oxford, were proposed as Honorary members of the Society, on the recommendation of the Council.

* The Anniversary Dinner was celebrated at Chidwall Abbey on Thursday, June 2nd, and was very successful. The only drawback was the absence of his Worship the Mayor, Charles Mozley, Esq., who was prevented from being present by severe indisposition.

Mr. J. J. Stitt was balloted for and elected an ordinary member.

Mr. MOORE exhibited a singular organic structure, from the Free Public Museum, which had been submitted to Dr. Gray for examination, and by him had been described before a late meeting of the Zoological Society of London, as indicating a new group of radiated animals nearly allied to Asterias, but forming a new family, for which he proposed the name of *Myriosteonidae*, and for the specimen itself the name of *Myriosteon Higginsii*, after the Rev. H. H. Higgins, by whom it had originally been obtained from a dealer. The specimen will be deposited in the British Museum.

Mr. MOORE next exhibited the bones of one of the flippers of a rare Cetacean (*Megaptera longimana*) which was stranded in the Mersey, near Speke, in July, 1863, and the skeleton of which, now mounted for public exhibition, was presented to the Free Public Museum by Mr. Thomas Brock. A fine stuffed specimen of a Chimpanzee was also exhibited by Mr. Moore. It differed considerably from ordinary examples of the Chimpanzee, in being entirely black, with the exception of a few white hairs on the chin. It belongs to Mr. Hulse, in whose possession it lived a considerable time in 1863.

A paper was then read, entitled :—

A COMPARISON OF THE HAND, FOOT, & BRAIN,
IN MAN AND THE CHIMPANZEE.

BY PROFESSOR ROLLESTON, F.R.S., UNIV. MUS. OXFORD.

(Communicated by Mr. T. J. Moore.)

This paper was accompanied by elaborate dissections of the parts described, made by the author, and presented by him to the Museum.

The following paper was also read :—

ON A NEW SPECIES OF CHÆTOPTERUS,

(*In a letter to T. J. Moore, Esq.*)

BY JOHN WILLIAMS ESQ., BEAUMARIS.

I first found *Chætopterus* at Beaumaris in December 1859, and have since met with plenty of them. In one spot they especially abound. I find them in hard, smooth sand and gravel, among Boulders. They lie very far down, and can only be obtained on a low spring ebb.

Both ends of the tube project from half an inch to a couple of inches above the surface of the ground, but they are often hidden by tufts of sea-weed growing upon them. The two ends are usually about a foot apart. I make it a rule to find both ends before I begin to dig, otherwise I should probably cut the tube in two. When therefore many tube ends are to be seen, great caution is necessary. Two appearing within six inches of each other indicate two tubes, unless they are very small.

I find great variety of size. Some tubes are not above eight inches long, and lie with their ends not three inches apart. Others are more than two feet long, and broad in proportion. In both the annelid is precisely the same in every respect except size; and I have always found the same parasite in either tube, but smaller in a small tube.

Here the tubes are less tough and leathery than in the South Carolina specimen in your Museum; but they are very thickly coated with adherent gravel and pebbles, which is not the case with that specimen. They are all made in horse-shoe form, just as they lie in the earth; and they cannot be stretched out straight without tearing that side which when *in situ* is the

uppermost. I have found one passing under a large stone, one end appearing at the surface on either side of it. It is not unusual when two tubes lie very near together, to find them adhering to each other; but I never find any communication between them. So, sometimes a tube is found which has a short length of similar structure fast to it. Here also I find no sort of internal communication, and the extra length, having only one outlet, is always disused and full of sand.

On one occasion I spent fully half an hour watching the tubes *in situ*, while there was still a few inches of water over them. I saw no movement whatever; no head projected, no apparent flow of water into or out of them; and no sign of their being tenanted. I have kept them alive for a week in a tank, both in and out of their tubes. Those in tubes sometimes come up to the top and project the head and tentacles: they retire quickly when touched. Those on the gravel move but very little. I have never seen them attempt to burrow, to make a new tube, or even to move away; but they are sensitive, and shrink when touched. The three lobes of the body are in constant slow, wavy motion, as if their skin acted as branchiae. The feet also, beneath the segments of the tail-half of the body, frequently move; each of the two series in its proper direction. The pairs of feet which are placed in the centre of each segment, and the posterior side of the disks which answer the same purpose in respect of the lobes, stomach, and head, are so placed as to work the annelid *backwards*. While the outer rows of feet—which bear small cirri—and the anterior halves of the disks above mentioned, work the body *forwards*. The action of these members must be materially assisted by the very remarkable comb-like bristles with which they are provided.

So far as I have been able to ascertain by dissection, the head has no evertile proboscis, nor any jaws. It contains a cup-like mouth, opening vertically when the annelid is at the



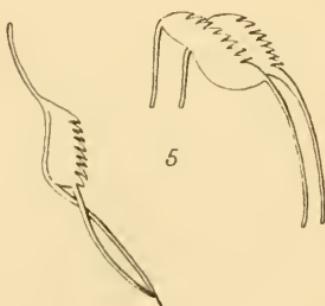
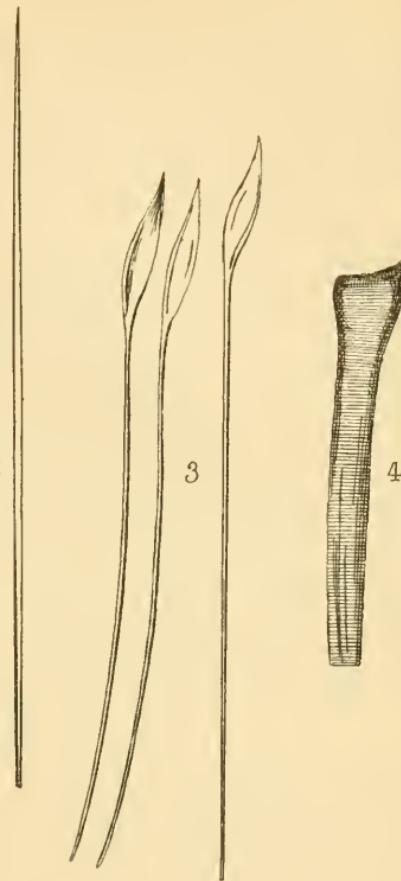
1. CHAETOPTERUS.

2. BRISTLE FROM TAIL SEGMENTS AND LONG PROCESSES ON HEAD

3. BRISTLES FROM LATERAL HEAD-PROCESSES.

4. BRISTLE FROM FOURTH LATERAL HEAD-PROCESS

5. BRISTLES WHICH FORM THE FAINT LINE ON FEET AND DISKS.



NATURAL SIZE

MAGNIFIED. -

11

11

11

mouth of its tubicular home, and having a lip round nearly the entire circumference, and leading into a wide throat, the inner surface of which is roughly ridged. But I find no tongue, jaws, nor teeth in it. On the upper side of the head, the lip is cut, and at each end of the opening springs a very lithe and active tentacle, thick, obtuse, rounded on the upper side, furrowed beneath. The edges of this furrow can meet so as almost to form a tube. Just at the root of each tentacle is a dark spot which looks like an eye. I fail, however, to convince myself that it possesses any powers of vision, or to trace any nervous system in connection with it.

On each side of the head the golden feet, or lateral processes are nine in number, formed of bristles clothed with flesh. On the fourth of each series there is a group of bristles quite different in form and colour from the others. I should much like to know their use, as well as that of the open bag which is placed upon the back of the annelid.

Bristles I find of four distinct kinds. In the two long processes like asses' ears, and in all the segments of the tail, the bristles are long, golden, straight, plain, and taper to a plain point. In all the processes on each side of the head they are somewhat shorter, golden, straight, or very slightly curved, truncate at the inner end, and tipped at the other with an elegant "spearhead," slightly bent to the form of the process. These "spearheads" overlap each other, and must give additional strength. On the lower part of the fourth lateral head-process appears a set of different bristles, short, thick, dark-coloured, truncate at both ends, almost club-shaped. The most remarkable of the bristles are those which, placed side by side in immense numbers, form the faint brown line observable along the edges of the feet and disks beneath the body. They are comb-like, having eight sharp teeth, and are firmly embedded in the flesh by a long tendon. The teeth of the combs are turned in the direction in which the feet

respectively bearing them are required to act. The number of these little saw-teeth bristles in each *Chætopterus* must be enormous, for many have forty segments in the tail portion, each segment having four feet (two to work each way.) I estimate that on each foot there may be a hundred of these combs—if so, the tail portion of the annelid would bear about 16,000 of them; and the disks and lobes half as many more, perhaps.

In every tube which contains a *Chætopterus*, without exception, I find a parasite—an annelid which corresponds with the description of *Polynœ* given in Mr. Gosse's Manual. It has bristles of one sort only, (long, pointed, toothed like a saw on one edge at least.) It has antennæ and two pairs of eyes. Its segments are alternately provided with soft appendages, (in this case the appendages are alternately shield-plates and cirri.) It has two pairs of teeth or jaws in an evertile proboscis. In large tubes the parasite is large; in small ones, small. I generally find it crouching on the lower segments of the body of *Chætopterus*: and the earliest intimation I receive of the death of that annelid, is from the exit of the parasitical *Polynœ* from the tube.

Your South Carolina specimen seems to have a crab parasite.

Near these *Chætopteri* I find various *Terebellæ*; *Cerianthus*; *Sabella*; *Mya* in great numbers; and a very large *Pholas*, buried at least a foot and a half in hard soil or clay, and having siphons, the open ends of which, at the surface of the ground, measure nearly two inches across. If you would like to have specimens of these, let me know and I will send you some when the tides ebb low enough to reach them.

The following paper was also read :—

THE HISTORICAL FAUNA OF LANCASHIRE AND CHESHIRE.

By CUTHBERT COLLINGWOOD, M.B., F.L.S., &c.,

Foreign Member of the Royal Physico-Economical Society of Königsberg.

IN the last volume of the Proceedings of this Society I published a paper on the *Ancient Fauna of Lancashire and Cheshire*, in which I endeavoured to obtain a glimpse at the past inhabitants which, in geologic ages successively peopled the region we now call the counties palatine of Lancashire and Cheshire,—as far as such a glimpse could be derived from the mutilated remains spared to us from the carboniferous and triassic rocks. In that paper I purposely abstained from entering upon any records of the historic period, reserving these for a future opportunity, which has now arrived. Should a new and elaborated edition of the Fauna of Liverpool ever be prepared, I venture to think that that paper would prove an interesting and appropriate introductory chapter; and the paper I am about to present is a supplement to it—a *second* introductory chapter to our local Fauna. In it I propose to bring forward, collected from every available source, the records of the appearance in our two counties of animals either rare at all times or which have at intervals appeared there, and thus left traces of their existence in the note-book of zoological observers. For in studying the Fauna of any district, attention should be directed not only to the every-day appearance of characteristic or dominant species, but also to the casual appearance of visitors, which from any cause have been drawn to the spot; since, for every such unwonted visitation there has doubtless been some natural reason; and while such visits invest a district with

unusual zoological interest, it must also be borne in mind that what has happened once, *may* happen again ; and it is at all events more probable that an animal which has *once* been observed, may visit us again, than that we should meet with one which has never been seen amongst us.

In the records of local Natural History observation, certain districts stand out conspicuously, from the accident of some ardent lover of nature having lived upon the spot, whose chronicles have rendered the place classical in zoological annals. Such districts are Hants and Sussex, celebrated by the diligence of such men as Gilbert White, and of Markwick ; such a region also is the Dorset and Devon coast, which the indefatigable Col. Montague scoured so thoroughly—and such may be called the Cornish coast, which has boasted a Borlase, and still boasts a Couch, and a Spence Bate. Such districts yield ample proof that it requires careful and continued observation to develope the riches of a given locality ; and were the same test applied to other localities they doubtless would not be behindhand in affording an interesting and extended historical Fauna. Antiquarians and naturalists too, have existed in most counties, who have collected information of greater or less value, relative to many parts of the country, and few of the older topographical works were regarded by their compilers as complete, without some account of the natural productions of the district described. But, still the value and extent of these sections of such works depend upon the character of the investigations which had been carried on by previous observers, and are most complete where such observers have been most numerous, accurate, and painstaking. Such works as Camden's *Britannia* also, contain scattered notices of the botany and zoology of the country, and occasionally give curious information as to the productions which have from time to time been met with.

The chief works relating specially to the counties palatine,

which have been found to yield information upon these topics, are Leigh's "Natural History of Lancashire," and Ormerod's "History of Cheshire." Of these the former is an old work, published in 1705, and contains numerous notices of great interest upon the Fauna of the county, but usually couched in quaint language, and describing the animals under peculiar names, which the modern zoologist has to translate into recent systematic phraseology, a task in which, however, he is aided by good plates. Ormerod's "History of Cheshire," published in 1819, is a much more voluminous work, but contains but few references to this department of local history, and the information derivable from it on this head is remarkably meagre. The former, however, professes to be a Natural History of the County, while the latter is a purely topographical work, of which almost the sum total of its zoological information is to be gleaned from the notices of the ancient forests of the county. The same may also be said of Mortimer's "History of Wirral." We have some brief notices in Pennant's Tour which possess a certain interest, and Leland's Itinerary touches upon some districts in our counties, a work, which having been written in the early part of the 16th century, cannot be otherwise than useful for our purpose.

The ancient condition of the two counties can scarcely be realized at the present day, when they are by no means remarkable for the growth of fine *timber*. Forests then abounded both in Lancashire and Cheshire, but more particularly in the latter county. The entire Hundred of Wirral was formed into a forest by Randle (Ranulphus) Meschines, third Earl of Chester, but was disafforested in the reign of Edward III, and twenty marks per annum allowed to the Stanleys in lieu of the profits of their office. Hence we see the truth of the old distich—

"From Blacon point to Hilbree
The squirrel might leap from tree to tree."

The Earl of Chester had originally five forests ; one of them is noticed in Domesday in Atiscros Hundred, ten miles long, and three broad, and contained four aeries of hawks ; but it is not noticed in any subsequent documents. The other forests were Wirral, (as above),—Mara and Mondrem, (of which the present Delamere forest is the remains,) and which with Macclesfield, were forests in the popular sense of the word as late as the time of the great rebellion, and even then abounded in vert and venison. The barons of Nantwich also had a forest called Cohul on the banks of the Weaver, probably near Coole Pilot, as well as the chase of Ulreswood (Ulresford) in the barony of Dunham. “The hole foreste of Maxwel except it be a smal spek is yn Chestre,” (Leland, iii, 42).

Moreover, the Conqueror* is said to have possessed in different parts of England 68 forests, 13 chases, and 781 parks ; and for the better understanding of what forests were at that period, we may quote the description of Manwood, the great authority on the forest laws, who defines a forest as being “a certain territory or circuit of woody grounds and pastures, known in its bounds, and privileged, for the peaceable being and abiding of wild beasts, and fowls of forest, chase and warren, to be under the king’s protection for his princely delight ; replenished with beasts of venery or chase, and great coverts of vert for succour of the said beasts, for preservation whereof there are particular laws, privileges, and officers belonging thereunto.” And with regard to the kind of animals to be so succoured,—the beasts of park or chase, according to Coke, are properly the buck, the doe, the fox,

* William had a summary method of increasing the forest lands : no need of planting trees or waiting for the slow growth of oaks and beeches. There were then many woods in merry England, and he simply swept away the homes of the villagers who dwelt among and near them, so that the lands returned to their natural state of wildness, and the stag crouched undisturbed on the hearth of the peasant, or in the long fern where once was the altar of the village church.” *Reed’s Lectures on English History*, p. 63.

the marten, and the roe; but the term in a wider sense comprehends all the beasts of the forest.* Beasts of warren are such as hares, conies and roes; fowls of warren, such as partridge, quail, rail, pheasant, woodcock, mallard, heron, &c. He adds “beasts of forest be properly hart, hind, buck, hare, boar, and wolf; but legally, all wild beasts of venery.” (Co. Litt., sec. 387). The oppressive character of the forest laws was at length relieved by the action of the Long Parliament in the reign of Charles I.

If we go back to a yet earlier historic age, we may still find records, which, although meagre and of a general kind, are no less interesting as affording us presumptive evidence of the nature of the Fauna of such well-wooded counties as Lancashire and Cheshire have at one time been.† In the “Archæology of Wales” is printed a Triad, or poem of three-lined stanzas, from the Book of the Triades—in British, *Trioedd Ynys Prydain*, or the threes of the island of Britain—which seems to have been written about the year 650 A.D. (Yorke’s Royal Tribes of Wales, p. 69). It is said to be from a MS. dated 1601, wherein the writer states that it was taken out of the books of Caradoc of Llancarven, who lived in the 12th century—the authenticity of these documents is therefore indisputable. From this authority we learn that the Kymri, a Celtic tribe, first inhabited Britain, and that before them, were no men here, but only bears, wolves, beavers, and oxen with high prominences, often mentioned by the Romans, as by Claudian, Martial, &c. Plutarch relates that *Bears* were taken to Rome from Britain and there

* Wild cats were also reckoned among beasts of chase, as appears by the charter of Richard II to the Abbot of Peterboro’, giving him permission to hunt the hare, fox, and *wild cat*.

† For the antiquity of the royal forests in England, “the best and surest argument (says Coke, 4, Inst. 319) is that the forests in England being 69 in number, except the New Forest in Hampshire, erected by William the Conqueror, and Hampton Court Forest by Henry VIII, are so ancient as no record or history doth make any mention of their history or beginning.”

excited great admiration. In the Penitential of Archbishop Egbert, said to have been composed about the year 750 A.D., bears are also mentioned as inhabitants of our forests; but the laws of Canute, enacted 270 years after, are silent concerning them; though in Domesday book they are cursorily mentioned. In England, *wolves* are alluded to for the last time in the reign of Henry IV, though Hollinshed tells us that in Scotland they committed great havoc in 1577. The last wolf on record in Britain was killed by Sir Ewan Cameron of Lochiel, in 1680, (Sir Oswald Mosley in the *Zoologist*, ii, 710), though in Ireland they existed as late as 1710. With regard to *Beavers*, in the Itinerary of Archbishop Baldwin by Giraldus de Barri A.D. 1188, we read, "The (river) Teivi has another singular particularity being the only river in Wales, or even in England which has beavers; in Scotland they are said to be found but in one river, but are very scarce." Sir Robert Hoare, from whose edition of Giraldus Cambrensis (p. 49) we quote, adds to this account (p. 57) "That the Beaver was an extremely scarce animal in Britain may be collected from the laws of Howel Dda, (Leges Wallicæ, 261) where it appears that even in those early days, when the skins of the stag, wolf, fox, and otter, were valued at only eight-pence apiece, the white weasel at twelve-pence, and the marten at twenty-four-pence, the skin of the beaver (Croan Llostlydan, that is the broad-tailed animal) was estimated at the exorbitant price of one hundred and twenty-pence." But, he further suggests that, if this Castor of Giraldus and the Avanc or Afange, of Humphrey Llwyd, are the same animal, it could not have been peculiar to the Teivi, since there are many places whose etymology is derived from the latter name; but probably the *otter* was the animal referred to by the latter writer. Further, Camden tells us that at Low Furnis in the north-west of Lancashire, the forests abound with Deer and *Wild Boars*, (iii, 142); and speaking of *Salfordshire*, Leland says (vii,

49,) “Wild Bores, Bulles and Falcons bredde in times past in Blakele.”*

It may easily be believed that in later times when such wild and destructive animals as bears, wolves, and wild boars had been exterminated, the forests would abound with beasts of the chase. The way in which Leland (iii, 42) speaking of the forests, and chacyes and parkes in Chesetershire, refers to the “fayre and large forest of Delamare, besides the wiche I remember none, and there is plenty of redde deere and falow,” (see Camden ii, 434) may, probably, be taken as representing the condition of all those parts of the country which had escaped disafforestation; for Delamere, although this fate was contemplated for it in the reign of Charles I, was not disafforested till 1812. Leland, however, wrote in the twenty-seventh year of the reign of king Henry VIII, but if we may judge from a document of the date of 1626, the profits accruing from similar sources a hundred years later were by no means very considerable. In a letter from Sir John Dene to the commissioners of Forests (Harleian M.S.) we find—“Particulars of profits appertaining to my office of forester and bailiff of Delamere Forest—

The sparrow-hawks and hobbies	0	0	0
The benefit of bees taken within the forest, rated communibus annis, per annum	5	0	0
My privilege to keep greyhounds, and to course and kill hares and foxes, within the forest—not rated	0	0	0

(Ormerod's Cheshire.)

* My object in this part of the paper has been to shew the kinds of beasts which probably overran most of England in historic times, and although I cannot quote instances of their having been found in these counties, it may be assumed that they inhabited this neighbourhood as well as the rest of England. The following additional references may be found useful by those interested in the subject.

Bears. Dissertation annexed to the Essay on the coins of Cunobelin, p. 126. Dissertation on the Coritani, p. 349. Archbishop Ussher's Antiquities, pp. 23, 53 and 91. Dugdale's Warwickshire, p. 298. Pennant's Zoology, I, 90.

Wolves. Dr. Caius de Canibus Brit., p. 499. Pennant, I, 88.

Wild Bulls. Archæologia, iii, 7. Fitzstephen's Description of London, 1772, p. 26.

Wild Boars. Essay on the coins of Cunobelinus, pl. ii, class 4, p. 98. See also Archæologia, x, p. 162.

Later on, the glory of Delamere had departed, and Pennant in his Tour describes it as “now a black and dreary waste ; it feeds a few rabbits, and a few black Terns skim over the splashes that water some parts of it.” (i, 3).

But in the very nature of things this change must come about, and in a county formerly noted for its great forests we are told by Smith, writing in the reign of Queen Elizabeth, of “the great store of *parks*, for every gentleman hath his own park.”

It is probable that this park-like aspect was partaken by the county of Lancashire, and that hence that county was long remarkable for its breed of cattle. Pennant calls attention to this fact in the following manner :—“The spectator (says he) has long since pointed out the knowledge which may be collected from signs—it is impossible not to remark the property of the reigning one of this county (Lancashire) ; the triple legs, and eagle and child, denote the great possessions of the Stanlies in these parts,—*the bull, the just pre-eminence of its cattle over other counties* ; and the royal oak, its distinguished loyalty to its sovereign.” He goes on to observe, “I am amazed they do not add the *Graces*, for no where can be seen a more numerous race of beauties among that order who want every advantage to set off their native charms.” (Tour, ii, 21). Drunken Barnaby, as he was called, who lived at the end of the 17th century, and published his four Itineraries in Latin Rhyme, celebrates at once the cattle and their treatment of him, as follows :—

“Veni Garstang ubi nata
Sunt Armenta fronte lata,
Veni Garstang, ubi malè
Intrans forum bestiale
Forte vacillando vico
Huc et illuc cum amico,
In Juvencæ dorsum rui
Cujus cornu læsus fui.”

Garstang, observes Pennant (Tour, i, 284), seated on a fertile

plain, is bounded on the east by the fells, and on the west by Pelling Moss. The adjacent country is famous for producing the finest cattle in all the county. A gentleman in that neighbourhood has refused thirty guineas for a three-year old cow; calves of a month old have been sold for ten, and bulls for seventy to one hundred guineas, which have afterwards been hired out for the season for thirty. In his "Zoology," he gives a figure of a *Lancashire cow*, but without any description. The Lancashire breed of oxen was ultimately superseded by the Leicestershire, which, however, is only the same blood improved by careful selection.

Dr. Leigh, in his "History of Lancashire," says, that "in a park near Bury, are wild cattel belonging to Sir Ralph Ashton of Middleton; these I presume were first brought from the Highlands of Scotland. They have *no horns* but are like the wild bulls and cows upon the continent of America." These certainly must have been very different from the local breed, for Bell tells us (History of British Quadrupeds, p. 420) that "the *long horns* originally, so far as our country is concerned, came from Lancashire."

Perhaps, next to cattle, the most important animals to man are those belonging to the order of fishes, on account of their great numbers and value as articles of food; and no fish has been more considered, or is worthy of more consideration in an economical point of view, than the Salmon. Bearing in mind the present state of the salmon fishery in our own river, (which is *nil*,) it is interesting to know its condition three-quarters of a century back. "The salmon fishery" (in the Mersey) says Pennant (Tour, ii, 212) "is very considerable, but the opportunity of sending them to London and other places at the *beginning of the season* keeps the price to about 8d. per pound, which gradually sinks to 3d. or 2½d., to the great aid of the poor manufacturers." And Ranulphus Cestriensis, speaking of the plenty which characterised the county of

Cheshire, says that it abounds with plenty of all kinds of provisions, corn, flesh, fish, especially *excellent Salmon*.

A correspondent, writing to *Loudon's Magazine*, thirty years ago (vii, 202), gives the following information with regard to the salmon fishery in the neighbouring river Ribble. He describes four kinds—1st. The Salmon, which varies in weight from 5 to 30lbs. Fresh fish never make their appearance before May; a few come during June, July, and August, but from the latter end of September to the end of December, they run up very freely. Some of the male kippers (kelts) come down in December and January, but the greater part of the females remain in the river until April, and are occasionally seen herding with shoals of Smelts in May. 2nd. The Mort, which he supposes to be *young Salmon*, weighing $1\frac{1}{2}$ to 3lbs. 3rd. The Sprod, which is the whitling, whiting, or berling of Scotland, weighing only 6 to 8oz., and ascends the river in July, disappearing in September; and 4th. The Pink or Par (also *young Salmon*,) weighing 1 to 3oz. The largest are all males, and in them the milt is large in October.

Smelts also, (*Osmerus eperlanus*) or as they are called in the North, sparlings, migrate, says Pennant, up the Mersey in spring, in amazing shoals, and of a size superior to those of other parts, some having been taken that weighed half-a-pound, and measured thirteen inches. This, he elsewhere says, was the largest he ever saw. (Zool. iii, 417). In his Zoology, he remarks that they were taken in the Dee as early as December, though they do not spawn till March or April; and that it had been observed that they never came into the Mersey as long as there was any snow water in the river.

In the Mersey, also, was found a small fish called the Graining, (*Leuciscus Lancastriensis*), a fish peculiar to our county, in some respects resembling the dace, yet a distinct species. Its usual length is $7\frac{1}{2}$ inches. It is rather more slender than the dace, the body almost straight, colour of

the scales silvery with a bluish cast, while those of the dace have a yellowish or greenish tinge. The eyes, and the ventral and anal fins of the graining, are of a pale colour. It was first noticed by Pennant in the Mersey near Warrington, the only other locality given for it being the river Alt, which runs by Sefton. At present it appears that the graining is common in the Weaver, where the dace is scarce, while in the Alt, where the dace abounds, the graining is not commonly met with. (Byerley's Fauna, p. 28.)

Singularly enough, another species of the genus *Leuciscus* appears to have been first met with in, and peculiar to, our county, viz., the Azurine (*Leuciscus caeruleus*), of which Yarrell received specimens from the township of Knowsley, and described it, and the last, in a paper in the 17th Vol. of the Linnæan Transactions.* This fish is termed locally *blue roach*, and, until described by Yarrell as above, was an unrecognized species, though both it and the graining were known to Professor Agassiz as inhabiting some Swiss lakes, but they had not been described by him. Mr. Byerley obtained specimens of the Azurine from a pit at Croxteth.

Another fish deserves especial mention, although found only upon the outskirts of this county, viz., in Windermere Lake, which divides Lancashire from Westmoreland. This is the Char, (*Salmo salvelinus*, Linn.; *S. umbla*, Jenyns,) a fish abounding in the cold Lapland lakes. Leland says, (vii, 63) "Wyner-mere wath (water ?) wherein a straunge fish called a *char*, not sene else there in the country as they say." But, Pennant, in his Tour, assures us that Winander-mere, Llyn Quellyn at the foot of Snowden, and Llynberis, as well as certain lakes in Merionethshire and Scotland, contained this fish, though in Llyn Quellyn and Llynberis, the copper works had, in his day, entirely destroyed them. 'The largest and most beautiful (he says) are taken in Winander-mere,

* Yarrell's original MS. description is in our Museum.

distinguished into the *case*, the *gelt* or *barren*, and the *red char*. The former spawn about Michaelmas, chiefly in the river Bratby, which has a black stoney bottom, and are in the highest perfection in May through the summer. The gelt char spawn from January to March, and keep in the smooth sandy parts of the lake, and are taken from the end of September to the end of November, and are esteemed more delicate for the table, especially potted. The spawning season of the Westmoreland chars agrees nearly with that of the Welsh ones, which from their colour are called *torgoch*, or red-belly, the other being paler." (See Gough's *Camden*, iii, 144.)

Lacepède (*Histoire des Poissons*, vol. iii, p. 70) refers to a species of cod under the name of *Le Gade nègre*, caught in the firths of Clyde and Solway, and also in the Mersey. He says, it grows to the length of eight inches or a foot; the lower jaw is longest, and provided with a beard; two long filaments distinguish each ventral fin, and the first dorsal consists of only one ray, which is jointed. Modern Ichthyologists, however, regard this, as well as the rock or red cod found off the Isle of Man, as simply varieties of the common codfish (*Gadus Morrhua*).*

Dr. Leigh claims for the eels near Manchester a quality superior to those of other parts, for says he, "The river Eske is remarkable for eels, which I think I may affirm to be the fattest in England, and indeed to that degree of fatness that they almost nauseate; and this, a late author, a gentleman of considerable estate near Manchester, attributes to the fat grease and oyles, which by the Woke-mills are expressed from the woolen cloaths, and so mixed with the water. And indeed, considering the number of these mills standing upon that river, and the extraordinary fatness of the eels, I do not

* In the British Room of the British Museum is a specimen of the Forked Beard (*Phycis furcatus*) about two feet long, and labelled from Liverpool. I am not aware, however, of its history. The *Phycis* is rare on the British coasts.

think the conjecture amiss." (Nat. Hist. of Lancash. p. 143.) Pennant, too, dilates with somewhat of epicurean gusto upon another delicacy from our shores. " *Ne fraudentur gloria sua littora.* I must, in justice to Lancashire, add that the finest mussels are those called *Hambleton Hookers*, from a village in that county. They are taken out of the sea, and placed in the river *Weir*, within reach of the tide, where they grow very fat and delicious." (Zool. iv, 237.)

Of more imposing fishes, I may mention that a *Sturgeon* twelve feet long has been taken in the Mersey, near Warrington, " in a salmon-fishery belonging to Mr. Thos. Patten, of that town," (Leigh, plate 6), and a *Sword-fish (Xiphias gladius)* is recorded by Pennant, (Zool. iii, 217), as having been taken " in October, 1785, in the new cut for the Dee, above Flint."

I have referred to these fishes somewhat out of their place because of their great interest, and of the importance which they give to our Fauna. And, before quitting the inhabitants of our waters, I may perhaps mention the visits of some large cetaceans, which have been recorded from time to time. Besides the specimens of *Hyperöodon Butzkopf*, described in the Fauna, there are notices of two other species of this genus having been found, viz., *Hyperöodon latifrons*, on the coast of Lancashire, (Knight's Cyclopaedia, Art. CETACEA,) and *H. rostratum*; the skeleton of the latter species (which was taken at the mouth of the Mersey) is in the museum of the Royal Institution. This is the specimen of which we read in the *Bolton Chronicle* for May 2nd, 1829, " A large whale of the beak-nosed kind was taken last week on this coast, near Liverpool." (See *Loudon's Magazine*, vol. ii, p. 391.) A Bottle-head whale (*H. Butzkopf*), is also recorded by Pennant, as having been found " in the recess of the tide in the new cut of the river Dee, below Chester," whose length was twenty-

four feet, and girth twelve feet. This was in October, 1785. The Bottle-nose dolphin (*Delphinus tursio*) is stated by Jenyns to have been taken in the Ribble, at Preston (Bell, 470). Our own river also (Mersey) has, within the last twelve months, been honoured with the visit of a rare species of whale, new to Britain (*Megaptera longimana*) whose skeleton now forms a very imposing object in the museum.

So also, *Seals* have occasionally come up our rivers. Dr. Leigh mentions a "sea-calf seal," as taken in the *Ribble*; and Pennant (Zool. i, 177) describes a pied seal (*Phoca bicolor*) of which he says, "this I saw at Chester; it was taken near that city in May, 1766." This appears to have been an individual of the species *Monachus albiventer*, (Gray, Mus. Cat.), a rare Mediterranean species, of which this is the only specimen recorded as captured upon British coasts.

Records of true Quadrupeds,* however, are very scarce in the zoological annals of Lancashire and Cheshire, and those of Reptiles, as might be anticipated from the paucity of species, are very unfrequent. A correspondent of Loudon's Magazine (vol. ix, p. 317) mentions the Natter-jack toad as common at Bootle, though not existing anywhere else, he adds, as far as I can learn; they make a great noise, and are called *Bootle organs*."

But, of Birds there are sufficient to raise these counties, and particularly Lancashire, into an interesting historical district. It is not easy to say why this should be, inasmuch as that county cannot be said to occupy any especially central or otherwise favorable situation, so far as regards the ordinary birds of passage or flight. It is true, however, that possessing a large extent of seaboard, and several large

* As this may be regarded as a Zoological History of these counties, it may be mentioned that the Water Shrew (*Sorex fodiens*) was known to Dr. Merret in the 17th century, but for a whole century was lost until it was rediscovered in Lancashire about 1770.

meres, it offers facilities to water-fowl, whether grallatorial or natatorial, and we shall see that these have a considerable share in the list.

Few of our rarer British birds excel the *rose-coloured Pastor* (*Pastor roseus*) in beauty. One of the earliest specimens recorded was taken near Ormskirk, where it is related, “one and sometimes more” have been shot (Penn); another at Salford. And we read in Loudon’s Magazine (vol. iv, 734), that in August, 1830, one was shot near Eccles. Mr. Blackwall also (Researches in Zoology) remarks, “this elegant species has, I believe, been found to occur more frequently in Lancashire than in any other part of the kingdom.” Another of the thrush tribe, the golden Oriole (*Oriolus galbula*), was taken at Gorton fields, near Manchester, in 1811; and again in Quernmore park, near Lancaster; the latter specimen is now in the museum of that town. (Yarr.) In May, 1830, one was taken at Toxal, in Cheshire, which is preserved in the Manchester museum. (Loudon, iv, 73.) Other interesting birds are spoken of as met with from time to time, as the pied flycatcher, said, by Pennant, to be more common in Lancashire and Yorkshire than in the rest of England—the Hoopoe (*Upupa epops*), the great grey Shrike (*Lanius excubitor*), the Waxwing (*Bombycilla garrula*), of which several were obtained in the vicinity of Middleton, Lancashire, in 1829, and which have recently re-appeared in the county—the grey wagtail (*Motacilla boarula*) of which, though a northern bird, Yarrell says, that in Lancashire and Cumberland, it is not only found all the summer, producing its young, but a few remain during winter. These last four birds (the pied flycatcher, hoopoe, waxwing, and grey wagtail,) also find a place in our recent Fauna list. The dipper (*Cinclus aquaticus*) inhabits some parts of Cheshire, and the tree-sparrow (*Passer montanus*) seems to have long been known as a frequenter of the neighbourhood of Chat Moss.

Lancashire appears to have been the southern limit of distribution of the Black Grouse (*Tetrao tetrix*), and the northern limit (on the west side of the island) of the lesser spotted Woodpecker (*Picus minor*). With regard to the latter genus, a species was described by Pennant under the name of the middle spotted woodpecker (*Picus medius*) as having been met with in Lancashire. This, however, was an error, as he himself imagined, the birds so characterised being only the young of the great spotted woodpecker (*Picus major*). The true *Picus medius* of Linnaeus is a continental form, which has never been met with in this country. Another, and much rarer woodpecker, is the great black woodpecker (*P. martius*), concerning which not a little doubt has been experienced as to its ever having been met with in this country. Montagu, in his supplement to the *Ornithological Dictionary*, says, "Lord Stanley assures us that he shot a *Picus martius* in Lancashire."* Yarrell tells us that "the specimen of the black woodpecker, formerly in the collection of Mr. Donovan (who was well known to give very high prices for British-killed birds, for his own use in his *History of British Ornithology*), was affirmed to have been shot in this country. At the sale of Mr. Donovan's collection, this specimen was purchased by the Earl of Derby."†

The pine Grosbeak (*Pyrrhula enucleator*) and the Crossbill (*Loxia curvirostra*) are recorded as rare visitors; but there is one little bird which has recently been added to our district Fauna list, and which possesses a peculiar interest in this

* Yarrell repeats this statement, and the same may be found in Latham's "General History of Birds," 1822, vol. 3, page 340. Under these circumstances, we might have hoped to have found the specimen in our Museum. But in the edition of Latham, annotated by the late Earl of Derby, and now in the possession of the present Earl, the passage, "one was killed in Lancashire by Lord Stanley," is erased, and in the margin is written in his Lordship's own hand—"a mistaken idea."

† I regret to say, however, that I have been unable to discover this specimen in our collection.

place. This is the Pettychaps, or Garden Warbler (*Curruca hortensis*), one of the sweetest of our summer songsters, which was first observed in Lancashire by Sir Ashton Lever, who obtained specimens in this county, and communicated them to Dr. Latham, at Dartford, by whom they were first described. One of the few specimens of the Lapland bunting (*Plectrophanes lapponica*), also, the fourth British one, was caught near Preston, and was taken to the Manchester market, where it was observed among a number of other small birds, and is now preserved in the Manchester museum. Among birds of prey, the Goshawk (*Astur palumbarius*) is remarkable, for being a northern bird of which Mr. Selby says that he had never seen a recent specimen south of the Tweed, but adds, that "it is known to breed on the wooded banks of the Dee." Nor would this list of curious and rare birds be complete without reference to the "Brasilian magpye," described and figured by Leigh (Table of ye Birds, fig. 2) "that was driven upon the coasts by the violent Hale storm, described in Mr. Burghers' first plate, and found dead upon the sea coast of Lancashire." The figure given resembles in every respect a species of Toucan. Fig. 3 of the same plate is called the "Tropick bird, driven in at the same time," and is described as "a bird all white (except only a short red beak) about the bigness of a pigeon."

Cheshire abounds not only with rivers and brooks, but also with broad sheets of water called *meres*. The principal of these are Oak mere, Pick mere, Budworth mere, Rosthern mere, Mere mere, Tatton mere, Chapel mere, Moss mere, Broad mere, Bah mere, and Comber mere. "The chefe occasion and the originale by likelihood of the manifolde Poolys and Lakes in Chestershire, was by diggings of Marle fattenye the baren Grownd there to beare good Corne. To the whiche Pitts the Faulle of the water thereabout and the springs hathe resortyd, and bysydes the Grownd there beyng

so depely dikid, there be many springs risyng naturally in them." (Leland vii, 11). Nor is Lancashire altogether deficient in them, while it possesses long level reaches of sand left bare at every tide, at Morecambe bay, as well as a long stretch of sea coast indented with the estuaries of the Ribble and the Mersey.

It is not, therefore, surprising that a great many aquatic birds should have been observed, several of them possessing considerable interest. Among these stand pre-eminent the great or Double Snipe (*Scolopax major*) which was first described as a British bird by Pennant (Zool. ii, 62) from a specimen shot in Lancashire, and preserved in the Leverian museum.* This species was at that time considered to be very rare, but it was probably undistinguished from the common snipe (*S. galinago*) ; and the Editor of the last edition of Pennant (1812) says, "I have known the species to be killed in England six or eight times, and it is probably met with oftener than imagined, as sportsmen talk of killing snipes occasionally of an extraordinary size." Another species, Sabine's snipe, (*S. Sabini*), is so rare that it is only known to have occurred half a dozen times, and then in the British Islands. One of these was taken at Clitheroe, in Lancashire, August 14th, 1820. Another bird which owes its first discovery as British to Lancashire, is the collared Pratincole (*Glareola torquata*), the capture of which is recorded in the eleventh volume of the *Linnaean Transactions* by Mr. Bullock of the London museum, who says, "the first instance of this bird having been killed in Britain occurred in 1807, when one was shot in the neighbourhood of Ormskirk, in Lancashire ; it was preserved by Mr. J. Sherlock, of that place, from whom I purchased it a few days afterwards."

* At the dispersion of the Leverian Museum, many specimens found their way into our own, and I hoped to have discovered this historical specimen in our own collection. I have searched for it, however, in vain : but we have an example killed by Mr. Hornby, at Winwick.

This specimen came into the possession of the Earl of Derby, and is now in good preservation in our own Museum. A second specimen was killed by the same Mr. Bullock in the Isle of Uist. It was sold with the contents of his museum, in 1819, and was bought for eight guineas and transferred to the British Museum. In the last edition of Pennant's Zoology, vol. ii, p. 110, our specimen was referred to under the name of Austrian pratincole (*Glareola Austriaca*), where it is said, "a solitary instance occurs of this curious bird, which seems to unite the swallow and the tern tribe, having visited England. It was shot in Lancashire."

Another bird of considerable interest to us is the glossy Ibis (*Ibis fulcinellus*), which, though not uncommon, is still an accidental visitor to this country. Yarrell tells us that "one occurred some years ago in Lancashire, and is preserved in the collection of the Earl of Derby in that county." That specimen also is now in our Museum. This bird receives a certain amount of interest from the fact that it is believed by some to be the *Liver* which figures upon the Liverpool arms. Montagu says, "the Ibis is adopted as a part of the arms of the town of Liverpool. This bird is termed a Liver, from which that flourishing town derived its name, and is now standing on the spot where the *Pool* was, on the verge of which the *Liver* was killed." On this passage, however, Yarrell remarks, "the arms of the town of Liverpool are, however, comparatively modern, and seem to have no reference to the Ibis. The bird has been adopted in the arms of the Earl of Liverpool, and in a recent Edition of *Burke's Peerage*, is described as a cormorant holding in the beak a branch of sea-weed. In the Plantagenet seal of Liverpool, which is believed to be of the time of King John, the bird has the appearance of a dove, with a sprig of olive, apparently intended to refer to the advantages that commerce would derive from peace. For a drawing of this ancient seal,

(he says), with various other particulars, and also for a notice of the recent occurrence of an Ibis near the town of Fleetwood, on the river Wyre, I am indebted to the kindness of John Skaife, Esq., of Blackburn." (II, 572.)*

The same gentlemen has in his possession a male and a female specimen of the Green Sandpiper (*Totanus ochropus*) that were shot at the end of July, 1837, on a small brook that falls into the Darwen, about three and a half miles south of Blackburn; and circumstances had induced the belief that this pair had bred in the neighbourhood. Another species of sandpiper, of the genus *Tringa*, is even more interesting from its rarity and from its having been taken within the limits of our own district. This is the Buff-breasted Sandpiper (*Tringa rufescens*), of which the third of the few specimens known as British was taken at Formby on the banks of the Alt, and was sent to Liverpool market for sale along with some snipes. It was a male, and is now preserved in the collection of the Rev. T. Staniforth, of Bolton Rectory, Skipton. The little Crake also (*Crex pusilla*) was taken in 1807, at Ardwick meadows, near Manchester.

A spurious species of coot is described by Pennant as having been discovered in Lancashire. This he calls the Great Coot (*Fulica aterrima*), and says that it differs from the common coot only in its superior size, and the exquisite blackness of its plumage. But modern authors reject it as a

* After all the discussions upon the identity of this bird, I confess I cannot see any reason to differ from the ingenious description given in *Archæologia*, vol. 21, p. 543, by Wm. Hamper, Esq. As he observes—"Mr. Gregson, in his Portfolio of Fragments, pronounces this heraldic description (of a cormorant) as dubious, observing that it has been cut and carved by our artists in all shapes, from that of a goose to a long-necked heron." Without disputing as to the legend upon the modern seal, there can be no doubt that this modern seal is a copy, and a bad one, of an older seal. In both the ancient and the modern seal, however, we have a bird which has neither the long legs of a heron, nor the long neck of a liver (?), but is as good a representation of a dove bearing an olive branch as we could expect to see in such a situation. The etymology of the name of Liverpool, or Liverpool, is, doubtless, topographical rather than heraldic or armorial; indeed, Mr. Hamper gives us reason to believe that the heraldic Lever is a bunch of *Flagges*, vert., as in the arms of Levermore, of Devonshire.

species, and consider it to be only the adult bird, of a more decided dark colour—a mere variety.

Two birds, esteemed as great delicacies, were formerly much more common in our counties than they are at present. I refer to Ruffs and Woodcocks. The ruffs (*Machetes pugnax*) are chiefly found in the fenny districts of Lincolnshire, Cambridgeshire and Norfolk; but Pennant informs us that in his time they visited a place called Martin Mere, in Lancashire, at the latter end of March or beginning of April, though they did not continue there more than three weeks (Zool. ii, 75, note). With regard to Woodcocks (*Scolopax rusticola*), he says in his Tour, that in the northern parts of Lancashire he saw “on the plains numbers of springes for woodcocks, laid between tufts of heath, with avenues of small stones on each side, to direct these foolish birds into the snares, for they will not hop over the pebbles. Multitudes are taken in this manner in the open weather, and sold on the spot for sixteen pence or twenty pence a couple (twenty years ago at sixpence or sevenpence), and sent to the all-devouring capital by the Kendal stage.

There are several heronries mentioned in Cheshire, but I do not know of any in Lancashire. They are at *Dunham Massey*, the seat of the Earl of Stamford and Warrington; *Combermere Abbey*, the seat of Viscount Combermere; *Hooton*, on the Mersey, the seat of R. C. Naylor, Esq.; *Ardley Hall*, the seat of R. E. Warburton, Esq.; and *Oulton Park*, the residence of Sir Philip Egerton, Bart., M.P.

Among natatorial birds, Bewick's swan (*Cygnus Bewickii*) is remarkable; for a flock of twenty-nine of these rare birds is recorded as having visited the neighbourhood of Manchester, on Dec. 10th, 1829, an account of which circumstance appeared in Mr. Blackwall's *Researches in Zoology*,—“one of these was wounded, and remained on a reservoir during nearly a year, the first four months of which it was voluntarily joined by

another of the flock." There is also a specimen in the Manchester Museum, which was obtained in the fish market of that town. The beautiful harlequin duck (*Fuligula histrionica*) the red-breasted Merganser (*Mergus serrator*) and the roseate Tern (*Sterna Dougallii*), have occurred, the first in Cheshire, and the second and third on the Lancashire coast. The great crested Grebe (*Podiceps cristatus*) was long known to breed on some of the Cheshire meres, and Pennant figures a species which he calls the *Tippet grebe*, as having been met with on Rostherne mere in Cheshire; but it appears to have been only an immature individual of the last species. The little Auk, however (*Mergulus melanoleucus*), appears to have been originally a Lancashire bird, since Pennant, who first described it as British, speaks only of one specimen, and says, "the bird our description was made from, was taken in Lancashire." One was taken alive at Sale, in Cheshire, 1824 (December 10th), and is now in the Manchester Museum. Lastly, the fork-tailed petrel (*Thalassidroma Leachii*) has been found both in Lancashire and Cheshire, blown inland by heavy gales from the north-west. (Loudon.)

Thus far I have confined myself to the Vertebrate Fauna, and have endeavoured to show that the counties of Lancashire and Cheshire have a zoological history of no inconsiderable interest. I have, however, yet to consider, but more briefly, the host of invertebrated animals, chiefly marine, some of which add greatly to this historical interest. For it is a noticeable fact that although we had not, a century back, a Montague upon our coast, whose researches had anticipated the work of recent observers; and further, that although no one appears to have investigated the productions of our shores until almost the present generation, when the labours of Mr. Tudor at Bootle, and Mr. Price at Birkenhead, first made our

district classical ; nevertheless the researches of these gentlemen, recent as they are, have, to a certain extent, already become matters of history. For in a growing community such as Liverpool and Birkenhead, whose importance has kept pace with the facilities for the passage to and fro of ships, with the extension of docks, and with the enlargement of warehouse space, it is a natural consequence that the conservation of the river for these ends, the construction of embankments and dock-walls, have so changed the aspect of the river's banks, that many localities which once yielded objects of the highest interest to the zoologist have been totally destroyed, and the marine animals which made those localities remarkable, have disappeared with them.

In the published histories of British Invertebrate groups, the counties of Lancashire and Cheshire do not occupy a very prominent position as sources of material. Regarded from this point of view, which may to a certain extent be taken as an index of the historic richness of this district, we shall find that the labours of former observers have been represented by only two or three groups. Mollusca in general have not any remarkable history, nor can any one be named previously to the present generation in connection with this large and important group, and all, therefore, that we know of the molluscan animals of our shores is embodied in our recent Fauna. Pennant states that *Venus (Cytherea) chione* had been found on the Cheshire coast, but that shell has no place in our present Fauna. So also Da Costa (British Conchology, p. 213,) mentions *Tellina bimaculata* as occasionally found in Lancashire. "This is a species considered by some naturalists to have been introduced erroneously into British catalogues. Its occasional appearance on our shores is probably to be ascribed to the frequent wreck of vessels from the West Indies, where it is abundant." Forbes and Hanley, i, 310.) *Turbo exoletus (Turritella cincta)* of

modern conchologists) is another shell of which somewhat the same might be said. It is an African form, but recorded by Da Costa from Lancashire. (See Linnæan Transactions, viii, 176.) One circumstance is particularly worthy of record in this place, for the knowledge of which I am indebted to my friend Mr. Byerley. It refers to *Mya arenaria*, a shell which was at one time found but rarely, and then dead. About ten years since, however, Mr. Byerley found that in a large piece of salt-water, enclosed by the recently constructed sea-wall immediately south of Seacombe slip, and to which the sea had access by a small opening, *Mya arenaria* occurred in great numbers, and often of peculiar form. The valves, instead of being of the ordinary form, were more or less twisted, sometimes as much so as in the case of the shell called *Arca tortuosa*. In addition to this peculiarity, a remarkable variation occurred in the interior. A lamina of the nacreous layer was separated from the interior of the shell, which thus formed a pouch into which a portion of the adductor muscle was inserted. In the same pool, and burrowing in the mud, might be found a number of magnificent *Dorsibranchiate* annelids, a foot long, of the species *Eunice gigantea*, (?) but the locality from which these interesting animals were once obtained in plenty no longer exists, and a busy ship-building yard now stands upon the spot.

One family of Mollusca, however, has a zoological history in connection with the estuaries of the Mersey and Dee, viz., the Nudibranchiata. Some of these are at present peculiar to those rivers, and the researches of Messrs. Price, Byerley and others, have indissolubly connected their names with the history of British Nudibranchs. In the Mersey, two species have been discovered by Mr. Price, which have no other locality. These are *Embletonia pallida*, and *Doris proxima*. The former was a minute species, described, but not figured in Alder and Hancock's great work, (Appendix, p. xii.) and

differing, (if it really differed, however, and was more than an immature specimen) from the other British species, *E. pulchra*, in having a double series of papillæ on each side, the tentacles placed nearer together, and the oral lobes small and indistinct, being united over the head in front, into a semi-circular veil. It is to be regretted that no figure of this supposed species occurs, since no other specimen has been found, and the locality is now either destroyed or so altered by the construction of the Birkenhead docks, as to render the discovery of another highly improbable.

Another species of Nudibranch may be claimed as a special possession of the district. This is *Antiopa hyalina*, an extremely beautiful form, first made known in 1851 by Mr. Byerley, who discovered it at Hilbre Island, at the mouth of the Dee. The figure in Alder and Hancock's work was made from this individual, which proved, however, to be an inferior specimen. Again, in 1854, the species was found in the same spot as before, a much finer specimen, and a third specimen occurred in 1859. Since then it has also once been taken. There are few instances of a species so well marked as *Antiopa hyalina*, recurring so often in the same spot, to the exclusion of all other localities; and the presence of this single species gives an interest to the Dee which is not surpassed by any other river.

An interest of a similar kind is given to the Mersey by the discovery in it of a species of Nudibranch, which though peculiar to the district proves to be not uncommon in the Mersey, nor indeed wholly confined to it, since it has also been found in the Dee. This is *Doris proxima*, a species first made known to Mr. Alder by Mr. Price of Birkenhead. At first it appeared to be a mere variety of *Doris aspera*, but closer examination disclosed points wherein it differed very importantly from that rather common form. But the remarkable fact is, that although commonly met with in these rivers,

it has, to the best of my knowledge, never been recorded hitherto as found anywhere else. On the other hand *Doris aspera* is unknown in the Mersey and Dee.

But besides these three species which are of such peculiar historical interest, it may be mentioned that of *Doris subquadrata*, first discovered at Torbay in 1845, the second specimen was found in the Dee in 1851 ; of *Eolis Landsburgii* found at Saltcoats in 1846, the second specimen was found in the Dee in 1849 ; while of *Eolis concinna*, of which four specimens were first taken at Whitley, in Northumberland, specimens were found for the second time in the Mersey in 1859.

There are but two other groups of invertebrate animals whose history in this country is connected with the counties of Lancashire and Cheshire. These are Spiders and Zoophytes. No connected history of the former has appeared prior to the publication of Blackwall's "Spiders of Great Britain and Ireland" by the Ray Society. Owing to the fact of a few gentlemen located in Lancashire, in the neighbourhood of Manchester and Southport having taken up the subject numerous discoveries of species have been made which clearly indicate that the science of Arachnology in England has but made a beginning, and that there is a wide field for future research. The numerous species which have been met with but once or twice, and the richness of the few localities in which diligent spider-hunters happen to have resided fully prove this, and hence Lancashire has a permanent zoological and historical interest in connection with this class of animals. I will enumerate the more interesting species which have been discovered in this country.

Of the following Spiders the only specimens recorded have been taken in our county, viz., *Salicuss parsus*, on the walls of Crumpsall Hall, near Manchester, in summer of 1828, (Annals, 2nd scr., vol. vii, p. 401). *S. floricola*, on the sand-hills at Southport, by the Rev. O. Pickard-Cambridge, in

1859. *S. Blackwallii*, near the sea-shore at Southport, discovered by the Rev. Hamlet Clark in 1855. *Drassus pumilus*, of which the Rev. O. P. Cambridge discovered an adult female on the sandhills at Southport, in June, 1859. *Philodromus oblongus*, has been taken only in the north of Lancashire and Cheshire. *Drassus reticulatus*, was captured by Mr. Walker, near Lancaster, in 1850. *Linyphia vivax*, described in the Linnaean Trans., xviii, 657, from specimens discovered in the greenhouses and melon-pits belonging to Mr. Derbyshire, of Green Heys, near Manchester, in Sept., 1836. *Linyphia gracilis*, of which mature males were found on rails at Crumpsall Hall, in Nov., 1836. (Linn. Tr., xviii, 666.) *Neriene rufipes*, obtained at Crumpsall, in 1832; *N. lugubris*, also obtained in the same locality in 1834. *N. trilineata*, not uncommon in the neighbourhood of Manchester, concealing itself under stones. *N. abnormis*, taken at Crumpsall Hall, in Oct., 1836; *Walcknaera turgida*, in the same place also in 1836. *W. aggeris*, at Southport, in 1859, by Rev. O. P. Cambridge. *W. humilis*, first obtained in Oct., 1836, under slates in a garden at Crumpsall Green, afterwards on rails at Crumpsall Hall, and in 1840 near Garstang, by Miss Clayton; and *W. fastigiata*, described from specimens found among moss at Southport, by Rev. O. P. Cambridge, in June, 1859.

Many interesting species also are recorded as having been first taken in Lancashire, though subsequently found elsewhere;—as *Drassus clavator*, discovered by the Rev. O. P. Cambridge, on the sandhills at Southport, in 1859, and afterwards at Portland. *Linyphia Claytoniae*, of which the original description was made from adult males taken by Miss Ellen Clayton, near Garstang, and described in the Linnaean Trans., xviii, p. 664. *Linyphia insignis*, the original specimen of which was an adult female, captured by Mr. John Parry, at Trafford, near Manchester, in the autumn of 1837. (Linn. Trans., xviii, p. 662.) *Neriene gracilis*, first taken at Crump-

sall Hall, in 1836. *N. munda*, also first discovered by Miss E. Clayton, at Garstang, in 1840. (Linn. Trans., xviii, 642.) *N. dubia*, of which the first specimen was captured at Crumpsall Hall, in 1836. *Walcknaera acuminata*, first taken by Mr. Thos. Blackwall, in 1832, in the township of Crumpsall. *W. monoceros*, discovered by Rev. O. P. Cambridge, at Southport, in 1859. *W. obscura*, at Crumpsall Hall, in 1834. *W. flavipes*, at same place, also in 1834. *W. cristata*, found in Oct., 1832, by Mr. Thos. Blackwall, in the neighbourhood of Manchester. *W. picina*, by Mr. T. Glover, in 1838, also in the neighbourhood of Manchester. *W. frontata*, at Crumpsall Hall, in autumn of 1832; since then at Lancaster, and in Cheshire; and *Pachygnatha Clerkii*, discovered by Mr. T. Blackwall, among rubbish in the township of Crumpsall, in 1831.*

A few Insects also deserve notice as connected with our historical Fauna. *Lithosia molybdeola*, has been taken only on the Lancashire mosses. *Nyssia zonaria*, was originally discovered upon the sandhills of New Brighton and Crosby, and since then at Hoylake, Puddington, and Point of Air. *Rhodaria sanguinalis*, which occurs abundantly upon the Wallasey sandhills, has only been taken as rare isolated

* In addition to this most interesting list of Spiders identified historically with Lancashire, many other species are found in this county among the few localities which are known for them. Of these I will merely enumerate the following list:—

<i>Salticus frontalis</i>	<i>Neriene marginata</i>
<i>S. distinctus</i>	<i>N. errans</i>
<i>Thomisus erraticus</i>	<i>N. vagans</i> (very common)
<i>Philodromus cespiticolis</i>	<i>N. pygmaea</i> (do.)
<i>Clubiona comata</i> (rare)	<i>N. cornuta</i> (rare)
<i>Cæloetes saxatilis</i>	<i>N. rubens</i>
<i>Theridion pallens</i>	<i>N. nigra</i> (rare, aeronautic)
<i>T. filipes</i>	<i>N. fuscata</i>
<i>Pholeus phalangioides</i> (Liverpool)	<i>Walcknaera cuspidata</i> (rare)
<i>Linyphia fuliginea</i>	<i>Pachygnatha Listeri</i>
<i>L. rubea</i>	<i>P. Degeerii</i>
<i>L. alticeps</i>	<i>Dysdera Hombergii</i> (common)
<i>L. longidens</i>	

But, it is somewhat remarkable that none of the rarer Epideridæ have been met with in Lancashire.

specimens in one or two other localities of England and Ireland. Mr. Brockholes, who gives me this information, also states that *Ephestia interpunctella* occurs in the streets of Liverpool, and nowhere else, to his knowledge, except London. *Pterophorus Loewii*, has only been found at Southport; and, *Tinea flavescentella*, is now being introduced into Liverpool, probably from abroad, being brought into the port by ships trading with Central America.

There remain but a few words to be said upon the subject of the Zoophytes, including the Polyzoa and Hydrozoa. Mr. Tudor, of Bootle, made investigations with regard to these which require notice, inasmuch as no history of British Zoophytes is complete which omits his name. He supplied many notices of species, which occurred in Bootle Bay, to Dr. Johnston, and to Dr. Landsborough, and both authorities refer to specimens received from him. Dr. Landsborough acknowledges the finest specimens of *Thuiaria articulata* and *Campanularia verticillata*, as Bootle specimens. *Flustra carbacea* (*Carbacea papyrea*?) also is mentioned by both as rare here, on Mr. Tudor's authority, but I am not aware of its having occurred of late years. The species *Sertularia margareta* of Hassall, appears to have been really an original Liverpool one, inasmuch as the late Dr. Johnston expressly states, (Brit. Zooph., vol. i, p. 73,) that he received it from Mr. Tudor, who obtained it at the mouth of the Mersey; and adds, "With respect to the discovery of this *Sertularia*, I feel it necessary to state that specimens were sent to me from Mr. Tudor through my ardent friend Mr. T. G. Rylands, of Bewsey House, many months previously to its publication by Mr. Hassall." One other species we may claim, namely, *Cellularia (Bugula) neritina*, of which the late Dr. Fleming (History of British Animals) says, "I possess a specimen from the collection of the late Dr. Walker, which he received from Miss Blackburne, from the coast of Cheshire." It is

rare, however, on the English coasts, and does not occur in our recent lists.

I have thus endeavoured to bring together, from the most varied and comprehensive sources, the scattered materials for the History of the Fauna of Lancashire and Cheshire, and have, I trust, proved that though these counties have not been the favoured residence of many of the industrious workers in this branch of science, they are by no means devoid of interest, but have borne their share in the work of discovery, and have afforded not a little aid in the enlargement of our knowledge of the productions of nature in the British Islands.

ADDITIONS TO THE LIBRARY,

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Journal of the Royal Dublin Society, No. 39, April, 1863	<i>The Society.</i>	
American Journal of Science and Art, May to July, 1863	<i>B. Silliman.</i>	
Journal of the Franklin Institute, Nos. 448-9— 50-1-2	<i>The Institute.</i>	
Journal of the Statistical Society, June to Sept., 1863	<i>The Society.</i>	
Proceedings of the Royal Society, Nos. 55-56 .	<i>The Society.</i>	
Journal of the Royal Asiatic Society, vol. 22, pt. 2	<i>The Society.</i>	
Transactions of the Tyneside Field Naturalists' Club, vol. 6, part 1	<i>The Club.</i>	
Journal of the Geological Society of Dublin, vol. 18, part 1	<i>The Society.</i>	
Proceedings of the British Meteorological Society, vol. 1. Nos. 7 and 8	<i>The Society.</i>	
Journal of Proceedings of the Linnæan Society, No. 26	<i>The Society.</i>	
Quarterly Journal of the Geological Society, Nos. 71-4-5	<i>The Society.</i>	
Proceedings of the Royal Geographical Society, vol. 7, Nos. 3, 4, and 5	<i>The Society.</i>	
Canadian Journal of Industry, N.S., Nos. 45 and 46	<i>The Canadian Institute.</i>	
Proceedings of the Zoological Society, 1861, pt. 1	<i>The Society.</i>	
Proceedings of the American Geographical and Statistical Society of New York, 1862-63, vol. 1, Nos. 1—3	<i>The Society.</i>	
Proceedings of the Natural History Society of Dublin, vol 3, parts 1 and 2	<i>The Society.</i>	

Title.	Donor.
Monthly Notices of the Astronomical Society, vol. 23, Nos. 6—8	<i>The Society.</i>
OCTOBER 19TH.	
Thirtieth Annual Report of the Cornwall Poly- technic Society, 1862	<i>The Society.</i>
Thirtieth Annual Report of the Yorkshire Philo- sophical Society, 1862	<i>The Society.</i>
On the Meteorology of England, Quarter ending June 30, 1863	
Quarterly Report of Meteorological Society of Scotland, March, 1863	<i>The Society.</i>
Journal of the Society of Arts, May to October .	<i>The Society.</i>
The Complete Theory of Groups, by Rev. T. P. Kirkman, M.A., F.R.S.	<i>The Author.</i>
On an Undescribed Indigenous Form of Amœba, by Dr. Wallich	<i>The Author.</i>
A Synopsis of the Geology of Durham and Northumberland, by Messrs. Hoare and Kirby .	
Forty-fifth Annual Report of the Royal Institu- tion of Cornwall, 1862	<i>The Institution.</i>
Abstract of Meteorological Observations taken in Tasmania, 1862	
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Lights and Shades of the East, by Framji Bomanji	<i>The Author.</i>
Proceedings of the Zoological Society, No. 61, part 3 ; No. 62, parts 1 and 3	<i>The Society.</i>
American Journal of Science and Art, No. 107 .	<i>B. Silliman.</i>
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Practical Information on the Deviation of the Compass, by J. T. Towson	<i>The Author.</i>
Quarterly Report of the Meteorological Society of Scotland, ending June, 1863	<i>The Society.</i>
Proceedings of the American Philosophical Society, No. 69	<i>The Society.</i>

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Proceedings of the Royal Institution, Nos. 37 and 38	<i>The Society.</i>
Report of the Health Committee, by the Borough Engineer	<i>The Corporation.</i>
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Proceedings of the Linnaean Society, No. 27 . .	<i>The Society.</i>
Ancient Meols; or, the Hoylake Antiquities, by the Rev. Dr. Hume	<i>The Author.</i>
 NOVEMBER 16th.	
Medico-Chirurgical Transactions, vol. 46	<i>The Society,</i>
Report of the British Association, Cambridge, 1862	<i>Dr. Inman.</i>
Proceedings of the Liverpool Architectural Society, 1861-62	<i>The Society.</i>
On the Typical Quadruped, by Dr. Collingwood	<i>The Author.</i>
Proceedings of the Liverpool Geological Society, sessions 3 and 4	<i>The Society.</i>
Journal of the Franklin Institute, No. 454 . .	<i>The Institute.</i>
Journal of the Society of Arts, 3 Nos. . . .	<i>The Society.</i>
Proceedings of the Zoological Society of London, parts 1 and 2, 1863	<i>The Society.</i>
On Zoological Nomenclature, by Sir W. Jardine .	<i>The Author.</i>
 NOVEMBER 30th.	
Proceedings of the Royal Physical Society of Edinburgh, 1859-62, 2 vols.	<i>The Society.</i>
Transactions of the Botanical Society of Edin- burgh, vol. 7, part 3	<i>The Society.</i>
The Anthropological Review, Nos. 1 to 3 . .	<i>The Society.</i>
The Canadian Journal of Industry, No. 47	<i>Canadian Institute.</i>
Proceedings of the American Geographical and Statistical Society of New York, 1862-3 . .	<i>The Society.</i>
Quarterly Journal of the Geological Society, No. 76	<i>The Society.</i>
Proceedings of the Philomathic Society, vol 8 .	<i>The Society.</i>
Annual Report of Peel Park Museum, 1863 . .	 <i>Corporation of Manchester.</i>
Journal of the Society of Arts, No. 574 . .	<i>The Society.</i>

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DECEMBER 14th.		
Proceedings of the Royal Society, No. 58	<i>The Society.</i>
Proceedings of the Royal Society of Edinburgh,		
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Journal of the Society of Arts	<i>The Society.</i>
1864.		
JANUARY 11th.		
Journal of the Royal Geographical Society, vol. 32	<i>The Society.</i>	
Journal of the Society of Arts, 4 Nos.	. . . . .	<i>The Society.</i>
Proceedings of the Royal Society, No. 59	. . . . .	<i>The Society.</i>
Journal of the Franklin Institute, No. 455	. . . . .	<i>The Society.</i>
Monthly Notices of the Royal Astronomical Society,		
vol. 26, No. 1	. . . . .	<i>The Society.</i>
Journal of the Statistical Society, vol. 26, part 4,		
and Index to the first 15 vols.	. . . . .	<i>The Society.</i>
Transactions of the Royal Scottish Society of Arts,		
vol. 6, part 3	. . . . .	<i>The Society.</i>
Canadian Journal of Industry, No. 48	<i>Canadian Institute.</i>
The Patent Question, by R. A. Macfie	<i>The Author.</i>
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Journal of the Royal Asiatic Society, vol. 20, parts		
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Journal of the Society of Arts	<i>The Society.</i>
Monthly Notices of the Royal Astronomical Society,		
vol. 23, No. 9, and vol. 24, No. 2	<i>The Society.</i>
Essay, by Professor Hennessey, on the Relations		
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Forty-third Annual Report of Leeds Philosophical		
Society	<i>The Society.</i>
Report of Geological and Polytechnic Society of		
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FEBRUARY 8th.		
Journal of the Scottish Meteorological Society,		
new series, No. 1	<i>The Society.</i>
Journal of the Society of Arts	<i>The Society.</i>
Silliman's American Journal, No. 108	<i>The Editor.</i>

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Proceedings of the Royal Society, No. 60	<i>The Society.</i>
Proceedings of the Institution of Mechanical	
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Proceedings of the Natural History Society of	
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Proceedings of the British Meteorological Society,	
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Journal of the Franklin Institute, No. 456	<i>The Institute.</i>

FEBRUARY 22nd.

Quarterly Journal of the Geological Society, No. 77	<i>The Society.</i>
Annual Report of the Plymouth Institution,	
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Proceedings of the Royal Geographical Society,	
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Journal of the Franklin Institute, No. 457	<i>The Institute.</i>
Proceedings of the American Geographical Society,	
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Journal of the Royal Dublin Society, No. 30	<i>The Society.</i>

MARCH 7th.

Proceedings of the Royal Society, vol. 18, No. 61	<i>The Society.</i>
American Journal of Science and Arts, vol. 37,	
No. 109	<i>The Editor.</i>
Journal of the Society of Arts	<i>The Society.</i>
Journal of Liverpool Polytechnic Society, 26th	
session	<i>The Society.</i>
“The Uses of Discussion,” by J. T. Danson	<i>The Author.</i>

MARCH 21st.

Monthly Notices of the Royal Astronomical Society,	
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Proceedings of the Berwickshire Naturalists' Club	<i>The Club.</i>
Canadian Journal of Industry, N.S., No. 49	<i>Canadian Institute.</i>
Proceedings of the Royal Geographical Society,	
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Title.	Donor.
Forty-first Annual Report of the Sheffield Literary and Philosophical Society	<i>The Society.</i>
Journal of the Society of Arts	<i>The Society.</i>

APRIL 4th.

Journal of the Statistical Society, March, 1864 : <i>The Society.</i>
Proceedings of the Institution of Mechanical Engineers, part 2
Proceedings of the British Meteorological Society, vol. 2, No. 10
Reale Instituto Lombardo, di Scienze e Lettere, vol. 1, part 1
Journal of the Society of Arts

APRIL 18th.

Journal of the Linnæan Society, No. 28
Journal of the Society of Arts
Journal of the Franklin Institute No. 458
Proceedings of the Royal Society, No. 62
Monthly Notices of the Royal Astronomical Society, vol. 24, No. 5

MAY 2nd.

Le Moniteur Illustré des Inventions
Proceedings of the Academy of Natural Sciences of Philadelphia, Nos. 3 to 7
Journal of the Society of Arts
Address of John Stewart, Esq., to the Royal Institution

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APPENDIX.

THE LEPIDOPTERA

OF THE

HUNDRED OF WIRRAL,

CHESTER.

READ BEFORE THE SOCIETY, 8TH FEBRUARY, 1864.

BY

J. FITZHERBERT BROCKHOLE, ESQ.

P R E F A C E .

In offering to the Society this list of the Lepidoptera of the Hundred of Wirral, I am aware that Mr. Byerley previously published one for the whole neighbourhood round Liverpool. Since then, the old classification of these insects has been entirely superseded by a more elaborate and correct one. Since that time also, the knowledge possessed by local entomologists has become more extended, and their researches have brought to light many species which had not previously been found in the district. I have considered it unadvisable to use an obsolete classification in recording these additions, and equally injudicious to combine the old one with the new; I have therefore concluded to present an entirely new list.

Moreover, there are errors of nomenclature in the old list, especially amongst the smaller and more obscure insects, which arose from the imperfect knowledge of those who gave the information. Thus, the *Ornix Meleagripennella* of the old list, is the *Gracilaria Tringipennella* of the new; *Chrysoclista Linneella* is *Gelechia Hermanniella*, the real *Linneella*, to the best of my knowledge, never having been found here. The specimens of *Nepticula Gratirosella* were merely *N. Aurella*. These three species were incorrectly named, and, I have no doubt that if a collection of that date had remained unaltered to the present time, examination and comparison would have pointed out other similar errors. If it be understood that information concerning Lepidoptera was then principally legendary, and that there were few older cabinets in the neighbourhood to refer to, it will be readily imagined how easily mistakes might arise.

Before, however, leaving the subject of the old list, I must congratulate the author on the able and painstaking manner in which he got it up.

The present list is drawn up with every care, and I offer it in the belief that it is correct as far as it goes; I say as far as it goes, because, I have no doubt future research will discover many additions. The whole of Wirral has not as yet been examined. Moreover, fresh species occasionally appear in old localities.

I have not worked much on the Lancashire side of the Mersey round Liverpool, so that I am not in a position to write a list from my own knowledge of the Lepidoptera found there. No doubt the majority are enumerated here, but there are a few species in and near Liverpool which have not as yet been found in Cheshire. Independently of the neighbourhood, there is a good field for research amongst the warehouses and stores of Liverpool.

With reference to this list, the person whose name is given with any statement is accountable for that statement, and the compiler is responsible for the remainder. I take this opportunity of thanking those who have so kindly assisted me.

Those species which have no notice of rarity or locality appended, must be understood as more or less abundant and generally distributed.

Of course, the changes which are taking place in and near Birkenhead are only too likely to influence the Lepidopterous fauna of that neighbourhood. Some local species may be destroyed there, and others introduced amongst woollen goods and other merchandise.

There is a good field for speculation in the apparent rarity or extinction of some species in the Hundred. Why, for instance, have some kinds been taken on a single occasion only, in a dozen or fifteen years? Have these strayed from some more distant part, or are they the offspring of such as have died out through not finding the conditions necessary for existence?

On the other hand, all are liable to be more plentiful in some seasons than in others, owing to certain peculiarities of season being more favourable for their development, and perhaps to the existence of fewer enemies at that time than at others. It is difficult, if not impossible, to assign a reason why moths should come freely to a known attraction on perhaps an unfavourable night, whilst scarcely a specimen is to be seen during evenings which seem the most propitious.

There is a noticeable difference in the time of appearance of insects generally distributed, according to the soil on which they are found. On the sand hills and sandy loam of Wallasey they are earlier than on the more inland clayey soils. These again, are earlier than those of the low, wet soil of the Upton valley. Thus, I have taken *Epunda lutulenta* in wasted condition at the end of August, near Wallasey; in good condition during September at Rock Ferry, and when getting wasted there, I have gone to the Upton valley and continued to take it in good condition in October. On the whole, the neighbourhood is rich in Lepidoptera, though the Rhopalocera and Sphingina are not specifically numerous.

The classification and nomenclature are those used in Stainton's "Manual of British Butterflies and Moths."

E R R A T A.

Page 7, for *Pamphilia*, read *Pamphila*.
,, 9, „ *Notodonidæ*, „ *Notodontidæ*.
,, 9, „ *Choania*, „ *Chaonia*.
,, 9, „ *Dictoæides*, „ *Dictæoides*.
,, 9, „ *Antigua*, „ *Antiqua*.
,, 10, „ *Stilpnoptia*, „ *Stilpnotia*.
,, 10, „ *Arctia*, „ *Arctia*.
,, 10, „ *Jacobæa*, „ *Jacobæa*.
,, 13.—Transpose lines 3 and 4.
,, 13, for *Heliophobis*, read *Heliophobus*.
,, 14, „ *Cubicularis*, „ *Cubicularis*.
,, 15, „ *Orbono*, „ *Orbona*.
,, 17, „ *Scapelosoma*, „ *Scopelosoma*.
,, 19, „ *Lithoriza*, „ *Lithorrhiza*.
,, 24, „ *Immitaria*, „ *Imitaria*.
,, 26, „ *Subfulveria*, „ *Subfulvaria*.
,, 28, „ *Derivaria*, „ *Derivata*.
,, 32, „ *Truncicolla*, „ *Truncicolella*.
,, 37, „ *Ungicella*, „ *Unguicella*.
,, 39, „ *Grallolita*, „ *Grapholita*.
,, 43, „ *Euonymellus* „ *Evonymellus*.
,, 46, „ *Getechia*, „ *Gelechia*.

LEPIDOPTERA.

RHOPALOCERA.

Family PAPILIONIDÆ.

Sub-Family PIERIDI.

Genus GONEPTERYX.

GONEPTERYX RHAMNI.

Seen by Mr. Almond at Upton.

Genus COLIAS.

COLIAS EDUSA.

Is occasionally met with but apparently is not permanent. I have seen it near Neston.

Genus PIERIS.

PIERIS BRASSICÆ.

PIERIS RAPÆ.

PIERIS NAPI.

Genus ANTHOCARIS.

ANTHOCARIS CARDAMINES.

More abundant at Puddington and Mollington than round Birkenhead.

Family NYMPHALIDÆ.

Sub-Family SATYRIDI.

Genus LASIOMMATA.

LASIOMMATA ÆGERIA.

Sparingly at Prenton. Puddington. Abundant near Queen's Ferry.
Mr. Almond.

LASIOMMATA MEGÆRA.

Genus HIPPARCHIA.

HIPPARCHIA SEMELE.

Abundant on Wallasey sand hills. Bidston Hill.

HIPPARCHIA JANIRA.

HIPPARCHIA TITHONUS.

*Genus Cœnonymphpha.***Cœnonymphpha Pamphilus**

Bidston Hill. Rock Ferry.

*Sub-Family VANESSIDI.**Genus Cynthia.***Cynthia cardui.**

Is seen occasionally.

*Genus Vanessa.***Vanessa Atalanta.**

Not abundant round Birkenhead. Common at Puddington.

Vanessa io.**Vanessa antiopa.**

I have seen one near Prenton Mount.

Vanessa polychloros.

I have seen one in Prenton Wood.

Vanessa urticæ.*Genus Grapta.***Grapta c. album.**

Once taken by Mr. Diggles, Tranmere.

*Sub-Family ARGYNNIDI.**Genus Argynnis.***Argynnis aglaia.**

Not abundant. Wallasey sand hills.

*Genus Melitæa.***Melitæa artemis.**In a single instance near Eastham.—*Mr. S. Archer.**Family LYCÆNIDÆ.**Genus Thecla.***Thecla quercus.**

I have bred one from a larva found in Eastham Wood.

*Genus Chrysophanus.***Chrysophanus phœas.**

*Genus POLYOMMATUS.***POLYOMMATUS ALEXIS.****POLYOMMATUS ÆGON.**

Bidston Hill.

*Family HESPERIDÆ.**Genus THANAOS.***THANAOS TAGES.**Formerly abundant at Gill Brook, Birkenhead.—*Mr. Almond.* Scarce at Prenton.*Genus PAMPHILIA.***PAMPHILA LINEA.**Near Eastham.—*Messrs. S. and F. Archer.***PAMPHILA SYLVANUS.**Between Raby and Bromborough.—*Mr. F. Archer.***HETEROCERA.***Group SPHINGINA.**Family ZYGÆNIDÆ.**Genus ANTHROCERA.***ANTHROCERA LONICERÆ.**Bidston Marsh.—*Mr. N. Cooke.* I stored larva on the side of Bidston Hill opposite Upton.**ANTHROCERA FILIPENDULÆ.***Family SPHINGIDÆ.**Genus SMERINTHUS.***SMERINTHUS OCELLATUS.****SMERINTHUS POPULI.***Genus ACHERONTIA.***ACHERONTIA ATROPOS.**

Scarce.

*Genus SPHINX.***SPHINX CONVOLVULI.**

A specimen was taken some years ago by Mr. J. Leyland, near Oxton.

*Genus DEILEPHILA.***DEILEPHILA GALII.**

Scarce. Wallasey sand hills.

*Genus CHÆROCAMPA.***CHÆROCAMPA ELPENOR.****CHÆROCAMPA PORCELLUS.**

Most abundant on Wallasey sand hills.

*Family SESIIDÆ.**Genus MACROGLOSSA.***MACROGLOSSA STELLATARUM.**

Scarce. Wallasey.

*Genus SESIA.***SESIAS FUCIFORMIS.**

Scarce. Bidston.

*Family ÆGERIIDÆ.**Genus SPHECIA.***SPHECIA BEMBECIFORMIS.**

Common in the north of Wirral.

*Group BOMBYCINA.**Family HEPIALIDÆ.**Genus HEPIALUS.***HEPIALUS HECTUS.**

Bromborough. Eastham. Puddington.

HEPIALUS LUPULINUS.**HEPIALUS HUMULI.****HEPIALUS VELLEDA.**

Eastham Wood.

HEPIALUS SYLVINUS.

Liscard. Bidston Marsh. Tranmere. Rock Ferry. Burton.

*Family ZEUZERIDÆ.**Genus COSSUS.***COSSUS LIGNIPERDA.**

Does not appear abundant now.

*Family NOTODONIDÆ.**Genus CERURA.***CERURA FURCULA.**

Scarce.

CERURA BIFIDA.**CERURA VINULA.***Genus NOTODONTA.***NOTODONTA DROMEDARIUS.**

Not common. Bidston, Claughton, Rock Ferry.

NOTODONTA ZICZAC.*Genus PTEROSTOMA.***PTEROSTOMA PALPINA.**

In a single instance this spring (1864) at Puddington.

*Genus DRYMONIA.***DRYMONIA CHOANIA.**

A specimen was taken some years ago by Mr. B. Cooke, Eastham Wood.

*Genus LEIOCAMPA.***LEIOCAMPA DICTÆA.****LEIOCAMPA DICTOÆIDES.**

Scarce. Bidston.

*Genus LOPHOPTERYX.***LOPHOPTERYX CAMELINA.***Genus DILOBA.***DILOBA CÆRULEOCEPHALA.**

Scarce. Bidston. Puddington.

*Genus PYGÆRA.***PYGÆRA BUCEPHALA.***Family LIPARIDÆ.**Genus DASYCHIRA.***DASYCHIRA FASCELINA.**

Common on Wallasey sand hills. Occurs more sparingly inland.

DASYCHIRA PUDIBUNDA.*Genus ORGYIA.***ORGYIA ANTIGUA.**

*Genus STILPNOPTIA.***STILPNOTIA SALICIS.**

Not common. Wallasey. Bidston. Hoylake.—*Mr. F. Archer.*

*Genus PORTHESIA.***PORTHESIA AURIFLUA.***Family LITHOSIDÆ.**Genus LITHOSIA.***LITHOSIA COMPLANULA.**

Scarce. Wallasey. Bidston. Puddington.

LITHOSIA GRISEOLA.

Scarce. Wallasey. Bidston.

*Genus NUDARIA.***NUDARIA MUNDANA.**

Scarce. Tranmere. Puddington.

*Family CHELONIDÆ.**Genus ARTCIA.***ARCTIA CAJA.***Genus PHRAGMATOBIA.***PHRAGMATOBIA FULIGINOSA.***Genus SPILOSOMA.***SPILOSOMA MENTHRASTI.****SPILOSOMA LUBRICEPEDA.***Genus DIAPHORA.***DIAPHORA MENDICA.**

Taken by Mr. Diggles. Tranmere.

*Genus CALLIMORPHA.***CALLIMORPHA JACOBÆA.**

Common on Wallasey sand hills.

*Family BOMBYCIDÆ.**Genus LASIOCAMPA.***LASIOCAMPA RUBI.**

Wallasey sand hills. Bidston Hill. Less frequent elsewhere.

LASIOCAMPA TRIFOLII.

Wallasey sand hills.

LASIOCAMPA QUERCUS.

*Genus PŒCILOCAMPA.***PŒCILOCAMPA POPULI.**

Bidston. Has been taken in Birkenhead.

*Genus CLISILOCAMPA.***CLISILOCAMPA NEUSTRIA.**

Upton valley.

*Genus ERIOGASTER.***ERIOGASTER LANESTRIS.**

Upton valley.

*Genus ODONESTIS.***ODONESTIS POTATORIA.***Family SATURNIDÆ.**Genus SATURNIA.***SATURNIA PAVONIA-MINOR.***Family PLATYPTERYGIDÆ.**Genus CILIX.***CILIX SPINULA.**

Not abundant round Birkenhead. Common at Puddington.

*Family PSYCHIDÆ.**Genus FUMEA.***FUMEA NITIDELLA.**Patrick Wood near Bromborough Mills. Near Lower Bebington.—*Mr. F. Archer.**Group NOCTUINA.**Sub-Group TRIFIDÆ.**Section BOMBYCIFORMES.**Family NOCTUO-BOMBYCIDÆ.**Genus THYATIRA.***THYATIRA DERASA.**

Bidston. Claughton. Tranmere. Puddington.

THYATIRA BATIS.

Less frequent than the last. Eastham. Puddington.

*Genus CYMATOPHORA.***CYMATOPHORA DUPLARIS.**

Scarce. Prenton Wood.

CYMATOPHORA FLAVICORNIS.

Scarce. Bidston Park Wood.

*Family BRYOPHILIDÆ.**Genus BRYOPHILA.***BRYOPHILA PERLA.***Family BOMBYCOIDÆ.**Genus ACRONYCTA.***ACRONYCTA PSI.****ACRONYCTA LEPORINA.**

Scarce. Bidston.

ACRONYCTA MEGACEPHALA.**ACRONYCTA RUMICIS.***Section GENUINÆ.**Family LEUCANIDÆ.**Genus LEUCANIA.***LEUCANIA CONIGERA.**Rock Ferry.—*Mr. Almond.***LEUCANIA LITHARGYRIA.****LEUCANIA LITTORALIS.**

Wallasey sand hills.

LEUCANIA COMMA.**LEUCANIA IMPURA.****LEUCANIA PALLENS.***Genus NONAGRIA.***NONAGRIA FULVA.**

Bidston Marsh. Tranmere. Puddington.

NONAGRIA DESPECTA.

Ledsham.

NONAGRIA TYPHÆ.**NONAGRIA CRASSICORNIS.**

Bidston Marsh. Burton. Scarce at Puddington.

*Family APAMIDÆ.**Genus GORTYNA.***GORTYNA FLAVAGO.***Genus HYDRÆCIA.*

Formerly more abundant round Birkenhead than at present.

HYDRÆCIA NICTITANS.

Common near Wallasey and Seacombe. I saw one once in Claughton.

HYDRÆCIA MICACEA.*Genus AXILIA.***AXILIA PUTRIS.***Genus XYLOPHASIA.***XYLOPHASIA RUREA.****XYLOPHASIA COMBUSTA, VAR.**

Everywhere with the insect.

XYLOPHASIA LITHOXYLEA.**XYLOPHASIA POLYODON.****XYLOPHASIA HEPATICA.**

Puddington.

*Genus HELIOPHOBIS.***HELIOPHOBIS POPULARIS.***Genus CHARÆAS.***CHARÆAS GRAMINIS.**Wallasey sand hills.—*Mr. J. Cooke.* Burton.*Genus CERIGO.***CERIGO CY THEREA.***Genus LUPERINA.***LUPERINA TESTACEA.****LUPERINA CESPITIS.**

Near Wallasey.

*Genus MAMESTRA.***MAMESTRA ABJECTA.**

Two were taken some years ago by Messrs. Almond and Warrington in Claughton fir-wood.

MAMESTRA ANCEPS.**MAMESTRA ALBICOLON.**

Wallasey sand hills.

MAMESTRA BRASICE.

*Genus APAMEA.***APAMEA BASILINEA.****APAMEA GEMINA.****APAMEA OBLONGA, VAR.**

Scarce. Wallasey.

APAMEA UNANIMIS.

Wallasey. Rock Ferry. Puddington.

APAMEA OCULEA.*Genus MIANA.***MIANA STRIGILIS.****MIANA FASCIUNCULA.****MIANA LITEROSA.**

Margin of Wallasey sand hills.

MIANA FURUNCULA.

Wallasey sand hills. Burton.

MIANA ARCUOSA.Scarce. Bidston Marsh.—*Mr. Almond.* Puddington.*Family CARADRINIDÆ.**Genus GRAMMESIA.***GRAMMESIA TRILINEA.****GRAMMESIA BILINEA, VAR.**

Rock Ferry. Scarce elsewhere.

*Genus CARADRINA.***CARADRINA MORPHEUS.**

Near Wallasey.

CARADRINA ALSINES.

Scarce. Wallasey. Bromborough.

CARADRINA BLANDA.**CARADRINA CUBIBULARIS.***Family NOCTUIDÆ.**Genus RUSINA.***RUSINA TENEBROSA.**

Scarce. Wallasey. Bidston. Puddington.

*Genus AGROTIS.***AGROTIS VALLIGERA.**

Wallasey sand hills.

AGROTIS PUTA.

I took one specimen some years ago near Wallasey.

AGROTIS SUFFUSA.

AGROTIS SAUCIA.

Scarce except in 1858. Bidston.—*Mr. Almond.* Upton valley. Eastham Wood.

AGROTIS SEGETUM.

AGROTIS EXCLAMATIONIS.

AGROTIS CORTICEA.

Near Wallasey.

AGROTIS CURSORIA.

Was formerly more plentiful than at present. Wallasey sand hills.

AGROTIS NIGRICANS.

Occasionally taken. Wallasey sand hills.

AGROTIS TRITICI.

Wallasey sand hills.

AGROTIS AQUILINA.

I have occasionally taken it on Wallasey sand hills.

AGROTIS OBELISCA.

Scarce. Wallasey sand hills.—*Mr. N. Cooke.*

AGROTIS AGATHINA.

A specimen was taken by Mr. Almond in August, 1854. Wallasey sand hills.

AGROTIS PORPHYREA.

Bidston Hill. Claughton fir-wood. Prenton Mount Wood.

AGROTIS PRÆCOX.

Not abundant. Wallasey sand hills.

Genus TRIPHIENA.

TRIPHIENA IANTHINA.

Not abundant. Tranmere. Rock Ferry. Puddington.

TRIPHIENA FIMBRIA.

Scarce. Wallasey. Claughton. Eastham Wood.

TRIPHIENA INTERJECTA.

Scarce. Wallasey.

TRIPHIENA ORBONO.

TRIPHIENA PRONUBA.

Genus NOCTUA.

NOCTUA AUGUR.

NOCTUA PLECTA.

NOCTUA C-NIGRUM.

Most abundant near Wallasey.

NOCTUA TRIANGULUM.

Rather sparingly scattered through the district.

NOCTUA BRUNNEA.

Scarce. Bidston.—*Mr. Almond.* Rock Ferry. Burton.

NOCTUA FESTIVA.**NOCTUA BELLA.****NOCTUA UMBROSA.****NOCTUA BAJA.****NOCTUA XANTHOGRAPHA.***Family ORTHOSIDÆ.**Genus TRACHEA.***TRACHEA PINIPERDA.**

In the fir-woods of Bidston, Claughton, Prenton, and Storeton. I took a specimen or two also, in Eastham Wood, some years ago.

*Genus TÆNIOCAMPA.***TÆNIOCAMPA GOTHICA.****TÆNIOCAMPA RUBRICOSA.****TÆNIOCAMPA INSTABILIS.****TÆNIOCAMPA OPIMA.**

Not abundant. Near Wallasey. Leasowe. Bidston.

TÆNIOCAMPA POPULETI.

Scarce, but generally distributed.

TÆNIOCAMPA STABILIS.**TÆNIOCAMPA GRACILIS.****TÆNIOCAMPA MUNDA.**

Bromborough. Eastham Wood. Puddington.

TÆNIOCAMPA CRUDA.

Most abundant in Eastham Wood.

*Genus ORTHOSIA.***ORTHOΣΙΑ UPSILON.**

Wallasey.

ORTHOΣΙΑ LOTA.**ORTHOΣΙΑ MACILENTA.**

Scarce at Rock Ferry. Common in Eastham Wood. Puddington.

*Genus ANTHOCELIS.***ANTHOCELIS RUFINA.**

Rather scarce. Bromborough.—*Messrs. Almond and Chant.* Eastham Wood. Puddington.

ANTHOCELIS PISTACINA.**ANTHOCELIS LUNOSA.****ANTHOCELIS LITURA.***Genus CERASTIS.***CERASTIS VACCINII.**

Bidston. Rock Ferry. Abundant in Eastham Wood. Puddington.

CERASTIS SPADICEA.

Much less abundant than the last.

*Genus SCAPELOSOMA.***SCAPELOSOMA SATELITIA.**

Bidston. Abundant in Eastham Wood. Puddington.

*Genus XANTHIA.***XANTHIA CITRAGO.**

Rock Ferry. More abundant at Puddington.

XANTHIA CERAGO.**XANTHIA FLAVAGO.**

Less frequent than the last. Bidston. Claughton. Tranmere. Puddington.

XANTHIA FERRUGINEA.*Family COSMIDÆ.**Genus TETHEA.***TETHEA SUBTUSA.**

Not common. Wallasey. Bidston. Tranmere. Puddington.

*Genus COSMIA.***COSMIA TRAPEZINA.***Family HADENIDÆ.**Genus DIANTHÆCIA.***DIANTHÆCIA CAPSINCOLA.****DIANTHÆCIA CUCUBALI.**

Scarce. Wallasey. Puddington.

DIANTHÆCIA CONSPERSA.

Mr. Warrington took one some years ago. Tranmere.

*Genus POLIA.***POLIA CHI.**

Bidston. Puddington. Burton.

*Genus DASYPOLIA.***DASYPOLIA TEMPLI.**

I took one several years ago at Bidston Lighthouse.

*Genus EPUNDA.***EPUNDA LUTULENTA.**

Scaree; Wallasey. Upton Valley. Rock Ferry.

EPUNDA LICHENEA.Wallasey. Has been taken also at Bidston.—*Mr. Almond.**Genus MISELIA.***MISELIA OXYACANTHE.***Genus AGRIOPIS.***AGRIOPIS APRILINA.**

Bidston. Rock Ferry. Eastham Wood. Puddington.

*Genus PHLOGOPHORA.***PHLOGOPHORA METICULOSA.***Genus EUPLEXIA.***EUPLEXIA LUCIPARA.***Genus APLECTA.***APLECTA OCCULTA.**

I took one several years ago near the Manor House, Claughton

APLECTA NEBULOSA.Bromborough.—*Mr. Almond.* Eastham Wood. Ledsham.**APLECTA HERBIDA.**

Ledsham.

*Genus HADENA.***HADENA ADUSTA.**

Wallasey. Puddington.

HADENA PROTEA.

Rock Ferry. Puddington.

HADENA DENTINA.**HADENA SUASA.**

Scaree. Wallasey. Bidston Marsh.

HADENA OLERACEA.**HADENA PISI.**

Most abundant near New Ferry.

HADENA THALASSINA.

Wallasey. Rock Ferry. Puddington.

HADENA CONTIGUA.

I took one specimen in 1860. Rock Ferry.

*Family XYLINIDÆ.**Genus XYLOCAMPA.*

XYLOCAMPA LITHORIZA.

Bidston. Tranmere. Eastham. Puddington.

Genus CALOCAMPA.

CALOCAMPA VETUSTA.

Scaree; Wallasey. Bidston. Upton Valley.

CALOCAMPA EXOLETA.

Not abundant.

Genus XYLINA.

XYLINA RIIZOLITHA.

I took a specimen in 1859. Upton Valley.

Genus CUCULLIA.

CUCULLIA CHAMOMILLÆ.

Several were taken by Mr. Almond some years ago. Bidston Hill.

CUCULLIA UMBRATICÆ.

Not plentiful. Wallasey. Bidston.

*Family HELIOTHIDÆ.**Genus HELIOTHIS.*

HELIOTHIS MARGINATA.

Generally scarce. I took the larva freely in 1857. Wallasey. Near New Ferry.

HELIOTHIS ARMIGERA.

A specimen was taken in 1857, by Mr. Almond, on the salt marsh near the mouth of Bromborough Pool.

Genus ANARTA.

ANARTA MYRTILLI.

Bidston Hill. Claughton fir-wood. Prenton Mount Wood.

Genus HELIODES.

HELIODES ARBUTI.

Prenton Lane. Puddington.

*Sub-Group QUADRIFIDÆ.**Section VARIEGATÆ.**Family PLUSIDÆ.**Genus ABROSTOLA.***ABROSTOLA TRIPLASIA.**

Scarce; Wallasey. Tranmere. Oxton. Puddington.

*Genus PLUSIA.***PLUSIA CHRYSITIS.**

Most abundant near Bromborough Mills, and at Puddington.

PLUSIA FESTUCÆ.

Round Birkenhead. Puddington.

PLUSIA IOTA.

Puddington.

PLUSIA PULCHRINA.

Seems scarce. Puddington.

PLUSIA GAMMA.*Family GONOPTERIDÆ.**Genus GONOPTERA.***GONOPTERA LIBATRIX.**

Rather scarce.

*Section INTRUSÆ.**Family AMPHIPYRIDÆ.**Genus AMPHIPYRA.***AMHIPYRA TRAGOPOGINIS.***Genus MANIA.***MANIA TYPICA.****MANIA MAURA.**

Bidston. Claughton. Upton Valley. Rock Ferry. Puddington.

*Section SERPENTINÆ.**Family EUCLIDIDÆ.**Genus EUCLIDIA.***EUCLIDIA MI.**

Scarce. Wallasey sand hills.

EUCLIDIA GLYPHICA.

Near Shotwick.—*Mr. Almond.* A specimen near Eastham.—*Mr. F. Archer.*

Family POAPHILIDÆ.

Genus PHYTOMETRA.

PHYTOMETRA ANEA.

Bidston Hill.

Group GEOMETRINA.

Family OURAPTERYDÆ.

Genus OURAPTERYX.

OURAPTERYX SAMBUCARIA.

Formerly in Clifton Park. Has been recently taken by Mr. Chant near Tranmere. Common at Puddington.

Family ENNOMIDÆ.

Genus EPIONE.

EPIONE APICIARIA.

Not plentiful. Wallasey. Rock Ferry. Puddington.

Genus RUMIA.

RUMIA CRATÆGATA.

Genus METROCAMPA.

METROCAMPA MARGARITATA.

Genus ELLOPIA.

ELLOPIA FASCIARIA.

Scarce. Prenton Mount Wood. Burton.

Genus EURYMENE.

EURYMENE DOLOBRARIA.

Scarce. Rock Ferry. Eastham Wood.—*Mr. Almond.*

Genus SELENIA.

SELENIA ILLUNARIA.

SELENIA "LUNARIA.

Scarce. Rock Ferry. Puddington.

Genus ODONTOPERA.

ODONTOPERA BIDENTATA.

Genus CROCALLIS.

CROCALLIS ELINGUARIA.

Not abundant.

*Genus ENNOMOS.***ENNOMOS TILIARIA.**

Clifton Park and adjacent part of Birkenhead. Claughton Park.—*Mr. Almond.* Does not seem so plentiful as formerly.

ENNOMOS FUSCANTARIA.

Scarce. Upton Valley. North Birkenhead.

ENNOMOS EROSARIA.

Scarce. Tranmere. Rock Ferry.—*Mr. Almond.*

*Genus HIMERA.***HIMERA PENNARIA.**

North Birkenhead and Eastham Wood.—*Mr. Almond.* Puddington.

*Family AMPHIDASIDÆ.**Genus PHIGALIA.***PHIGALIA PILOSARIA.**

In most woods.

*Genus NYSSIA.***NYSSIA ZONARIA.**

Formerly abundant on Wallasey sand hills. Hoylake sand hills. Puddington Marsh. It maintains existence in a portion of the last locality which is often covered by the tide.

*Genus AMPHIDASIS.***AMPHIDASIS PRODEMARIA.**

Has been taken by Mr. Galliers as recorded in the *Intelligencer*, Eastham Wood.

AMPHIDASIS BETULARIA.*Family BOARMIDÆ.**Genus HEMEROPHILA.***HEMEROPHILA ABRUPTARIA.**

Scarce. Upton. Tranmere. Rock Ferry.

*Genus CLEORA.***CLEORA LICHENARIA.**

Scarce at Frankby. Prenton Wood.

*Genus BOARMIA.***BOARMIA REPANDATA.****BOARMIA RHOMBOIDARIA.**

Not plentiful. Tranmere. Puddington.

*Genus GNOPHOS.***GNOPHOS OBSCURATA.**

Wallasey. Bidston. Tranmere. Burton.

*Family GEOMETRIDÆ.**Genus PSEUDOTERPNA.***PSEUDOTERPNA CYTISARIA.**

Bidston Hill. Claughton fir-wood.

*Genus GEOMETRA.***GEOMETRA PAPILIONARIA.**

Scarce. Bidston. Rock Ferry. Ledsham.

*Genus IODIS.***IODIS LACTEARIA.***Genus HEMITHEA.***HEMITHEA THYMIARIA.**

Not abundant.

*Family EPHYRIDÆ.**Genus EPHYRA.***EPHYRA PUNCTARIA.**

Scarce. Eastham Wood.

*Family ACIDALIDÆ.**Genus ASTHENIA.***ASTHENIA LUTEATA.**

Scarce. Puddington. Burton.

ASTHENIA CANDIDATA.

Rather scarce. Wallasey. Bidston.

*Genus EUPISTERIA.***EUPISTERIA HEPARATA.**

Not very common. Rock Ferry. Burton. Puddington.

*Genus ACIDALIA.***ACIDALIA SCUTULATA.****ACIDALIA BISETATA****ACIDALIA OSSEATA.**

Not uncommon. Margin of sand hills near Wallasey Village.

ACIDALIA VIRGULARIA.

Not scarce on Bidston Hill. Occasionally taken elsewhere.

ACIDALIA SUBSERICEATA.

Scarce. Bidston.

ACIDALIA REMUTATA.**ACIDALIA IMMITARIA.**

Bidston.

ACIDALIA AVERSATA.

Most frequent in woods.

*Genus BBADYEPETES.***BRADYEPETES AMATARIA.**

Not common. Puddington.

*Family CABERIDÆ.**Genus CABERA.***CABERA PUSARIA.****CABERA EXANTHEMATA.***Genus CORYCIA.***CORYCIA PUNCTATA.**

Mr. Almond took specimens in Eastham Wood.

*Family MACARIDÆ.**Genus MACARIA.***MACARIA LITURATA.**

Rather scarce. Prenton Mount Wood.

*Genus HALIA.***HALIA WAVARIA.***Family FIDONIDÆ.**Genus STRENIA.***STRENIA CLATHRATA.**

Puddington.

*Genus LOZOGRAMMA.***LOZOGRAMMA PETRARIA.**Formerly on Flaybrick Hill.—*Mr. Almond.* Bidston Park Wood. Eastham Wood.*Genus NUMERIA.***NUMERIA PULVERARIA.**

Scarce. Claughton. Trammere. Rock Ferry. Eastham Wood.

*Genus MÆSIA.***MÆSIA BELGIARIA.**

Scarce. Bidston Hill.

*Genus FIDONIA.***FIDONIA ATOMARIA.**

Burton.

FIDONIA PINIARIA.

Fir woods of Bidston, Prenton, Storeton and Burton. I took a specimen also near Queen's Ferry.

*Family XERENIDÆ.**Genus ABRAXAS.***ABRAXAS GROSSULARIATA.****ABRAXAS ULMATA.**

Bidston. Rock Ferry. Puddington. Eastham.—*Mr. F. Archer.*

*Genus LOMASPILIS.***LOMASPILIS MARGINATA.***Family HYBERNIDÆ.**Genus HYBERNIA.***HYBERNIA RUPICAPRARIA.****HYBERNIA LEUCOPHEARIA.**

Scarce in Prenton Wood. Patrick Wood near Bromborough mills. Eastham Wood. Scarce at Puddington.

HYBERNIA AURANTIARIA.

I have taken one. Puddington.

HYBERNIA PROGEMMARIA.**HYBERNIA DEFOLIARIA.**

Rather scarce. Bidston. Upton. Has been taken in Birkenhead. Eastham Wood. Ledsham.

*Genus ANISOPTERYX.***ANISOPTERYX ÆSCULARIA.***Family LARENTIDÆ.**Genus CHEIMATOBIA.***CHEIMATOBIA BRUMATA.***Genus OPORABIA.***OPORABIA DILUTATA.**

Tranmere. Puddington.

OPORABIA FILIORAMMARIA.

Mr. Almond has taken it on Bidston Hill.

*Genus LARENTIA.***LARENTIA DIDYMATA.**

LARENTIA MULTISTRIGARIA.

Wallasey. Bidston. Burton.

LARENTIA MIARIA**LARENTIA OLIVARIA.**

Bidston.—*Mr. Almond.*

*Genus EMMELESIAS.***EMMELESIAS AFFINITATA.****EMMELESIAS ALCHEMILLATA.**

Patrick Wood, near Bromborough mills.—*Messrs. Almond and Warrington.*
Puddington.

EMMELESIAS ALBULATA.**EMMELESIAS DECOLORATA.****EMMELESIAS UNIFASCIATA.**

Scarce. Wallasey sand hills.—*Mr. N. Cooke.*

*Genus EUPITHECIA.***EUPITHECIA LINARIATA.**

Bidston. Tranmere.

EUPITHECIA PULCHELLATA.

Scarce. Prenton Mount Wood. Rock Ferry. Burton.

EUPITHECIA CENTAUREATA.

Wallasey. Bidston.

EUPITHECIA SUCCENTURIATA.

Scarce at Wallasey. More frequent near Tranmere. Puddington.

EUPITHECIA SUBFULVERIA.

Wallasey. Burton.

EUPITHECIA PYGMAEATA.

Puddington.

EUPITHECIA SATYRATA.

I bred a specimen some years ago, but I do not know where I got the larva.
It was obtained near Birkenhead. Burton.

EUPITHECIA CASTIGATA.**EUPITHECIA INNOTATA.**

Scarce. Rock Ferry. Puddington.

EUPITHECIA INDIGATA.

Scarce. Prenton Mount Wood. Burton.

EUPITHECIA CONSTRICTATA.

A specimen accidentally bred. Clifton Park. Burton.

EUPITHECIA NANATA.

Bidston Hill. Claughton fir wood. Prenton Mount Wood.

EUPITHECIA SUBNOTATA.

Scarce. Wallasey. Birkenhead.

EUPITHECIA VULGATA.**EUPITHECIA ABSYNTHIATA****EUPITHECIA ASSIMILATA.****EUPITHECIA ABREVIATA.**

Eastham Wood. Puddington.

EUPITHECIA EXIGUATA.

Puddington.

EUPITHECIA PUMILATA.

Bidston Hill. Claughton fir wood.

EUPITHECIA RECTANGULATA.

Occasionally taken.

*Genus LOBOPHORA.***LOBOPHORA HEXAPTERATA.**

Rather scarce. Puddington.

*Genus THERA.***TERA VARIATA.**

In most fir woods.

TERA FIRMARIA.

Not abundant. Prenton Mount Wood. Puddington.

*Genus YPSIPETES.***YPSIPETES IMPLUVIATA.**

In most woods.

YPSIPETES RUBERARIA.

Occurs with the last. Are they really distinct species?

YPSIPETES ELUTATA.*Genus MELANTHIA.***MELANTHIA RUBIGINATA.**

Rock Ferry. Puddington. Ledsham.

MELANTHIA PLUMBATA, VAR.

Ledsham.

MELANTHIA OCELLATA.

Tranmere. Prenton Mount Wood. Burton.

*Genus MELANIPPE.***MELANIPPE UNANGULATA.**

Not common. Neighbourhood of Flaybrick Hill. Tranmere. Ledsham. Puddington.

MELANIPPE BIRIVIATA.

MELANIPPE MONTANATA.

MELANIPPE GALIATA.

Wallasey sand hills.

MELANIPPE FLUCTUATA.

Genus ANTICLEA.

ANTICLEA BADIATA.

ANTICLEA DERIVARIA.

Rather scarce, Tranmere: common, Ledsham.

Genus COREMIA.

COREMIA PROPUGNATA.

COREMIA FERRUGARIA.

Mr. Almond has taken specimens near Birkenhead.

COREMIA UNIDENTARIA, VAR.

This is the ordinary form in the Hundred of Wirral.

Genus CAMPTOGRAMMA.

CAMPTOGRAMMA BILINEATA.

CAMPTOGRAMMA GEMMARIA.

I took a specimen of this insect on the ground now occupied by the entrances to the Great Float, Birkenhead. Mr. Almond took a specimen near Claughton Park, Birkenhead.

Genus PHIBALAPTERYX.

PHIBALAPTERYX LIGNATA.

Bidston Marsh.

Genus SCOTOSIA.

SCOTOSIA DUBITATA.

Occasionally taken.

Genus CIDARIA.

CIDARIA MIATA.

Has been taken in North Birkenhead.

CIDARIA CORYLATA.

Seems scarce. Puddington.

CIDARIA RUSSATA.

CIDARIA IMMANATA.

CIDARIA SUFFUMATA.

CIDARIA PRUNATA.

A single specimen, Burton.

CIDARIA TESTATA.

CIDARIA FULVATA.

CIDARIA PYRALIATA.

Tranmere. Rock Ferry. Puddington.

CIDARIA DOTATA.

In a single instance. Puddington.

*Genus PELURGA.***PELURGA COMITATA.**

Wallasey.

*Family EUBOLIDÆ.**Genus EUBOLIA.***EUBOLIA CERVINATA.**

Tranmere. Was formerly not uncommon at the lamps in Clifton Park.

EUBOLIA MENSURARIA.**EUBOLIA PLUMBARIA.**

Bidston Hill. Fir woods of Claughton and Prenton Mount.

EUBOLIA LINEOLARIA.

Wallasey sand hills.

*Group PYRALIDINA.**Sub-Group DELTOIDES.**Family HYPENIDÆ.**Genus HYPENA.***HYPENA PROBOSCIDALIS.***Genus HYPENODES.***HYPENODES COSTÆSTRIGALIS.**

Fir wood on Bidston Hill near the Upton Road. Prenton Mount Wood.

*Family HERMINIDÆ.**Genus RIVULA.***RIVULA SERICEALIS.**

Not abundant. Ledsham.

*Genus HERMINEA.***HERMINEA TARSIPENNALIS.**

Seems scarce. Puddington. Burton.

HERMINEA NEMOALIS.

Common in Eastham Wood. Taken occasionally near most woods.

*Sub-Group PYRALITES.**Family PYRALIDÆ.**Genus PYRALIS.***PYRALIS FARINALIS.**

Generally found where corn, meal, &c., are stored. I bred several from amongst moss obtained on the river bank near New Ferry.

*Genus AGLOSSA.***AGLOSSA PINGUINALIS.**

Stables and outhouses.

*Family ENNYCHIDÆ.**Genus PYRAUSTA.***PYRAUSTA PURPURALIS.**

Wallasey sand hills. Ledsham.

PYRAUSTA OSTRINALIS.

Wallasey sand hills.

*Genus RHODARIA.***RHODARIA SANGUINALIS.**

Wallasey sand hills.

*Genus HERBULA.***HERBULA CESPITALIS.***Genus ENNYCHIA.***ENNYCHIA CINGULALIS.**

Wallasey sand hills.

*Family HYDROCAMPIDÆ.**Genus CATACLYSTA.***CATACLYSTA LEMNATA.***Genus PARAPONYX.***PARAPONYX STRATIOTATA.**

Bidston Marsh.

*Genus HYDROCAMPA.***HYDROCAMPA NYMPHÆATA.****HYDROCAMPA STAGNATA.***Family BOTYDÆ.**Genus BOTYS.***BOTYS FUSCALIS.**

BOTYS TERREALIS.

In a single instance. Puddington.

BOTYS URTICATA.

Genus EBULEA.

EBULEA SAMBUCALIS.

Amongst elders. Birkenhead.

Genus PIONEA.

PIONEA FORFICALIS.

Genus SPILODES.

SPILODES STICTICALIS.

Scarce. Near Wallasey.

Genus SCOPULA.

SCOPULA LUTEALIS.

SCOPULA OLIVALIS.

SCOPULA PRUNALIS.

SCOPULA FERRUGALIS.

Wallasey sand hills. Bidston. Rock Ferry.

Genus STENOPTERYX.

STENOPTERYX HYBRIDALIS.

*Family NOLIDÆ.**Genus NOLA.*

NOLA CUCULATELLA.

Formerly plentiful in a hedge which has been destroyed, Bidston Marsh.

Occasionally taken elsewhere. Abundant, Puddington.

NOLA CRISTULALIS.

Seems scarce. Puddington.

*Family CHOREUTIDÆ.**Genus SIMÆTHIS.*

SIMÆTHIS FABRICIANA.

*Sub-Group CRAMBITES.**Family EUDOREIDÆ.**Genus EUDOREA.*

EUDOREA CEMBRÆ.

Scarce. I took this species on the ground now occupied by the entrances to the Great Float, at Birkenhead.

EUDOREA AMBIGUALIS.

EUDOREA PYRALELLA.

Ledsham. Puddington.

EUDOREA TRUNCICOLLA.

Amongst fir trees.

EUDOREA FREQUENTELLA.

Common on Bidston Hill. Puddington.

EUDOREA MURANA.

Locality forgotten.

EUDOREA ANGUSTEAA.

EUDOREA PALLIDA.

Bidston Marsh.

Family GALLERIDÆ.

Genus APHOMIA.

APHOMIA COLONELLA.

Has been taken occasionally. Wallasey. Puddington. Burton.

Family PHYCIDÆ.

Genus ANERASTIA.

ANERASTIA LOTELLA.

Wallasey sand hills.

Genus EPHESTIA.

EPHESTIA ELUTELLA.

About houses.

Genus OMÆOSOMA.

OMÆOSOMA NIMBELLAA.

Wallasey sand hills.

Genus ACROBASIS.

ACROBASIS CONSOCIELLA.

I took a single specimen on a lamp in Clifton Park.

Genus CRYPTOBLABES.

CRYPTOBLABES BISTRIGA.

Scarce. Bidston Park Wood. Taken also by the late Mr. Langcake not far from Birkenhead, but I do not know where.

Genus PEMPELIA.

PEMPELIA FUSCA.

Bidston Hill. Claughton fir wood.

PEMPELIA PALUMBELLA.

Seems scarce. Bidston Hill.

*Family CRAMBIDÆ.**Genus CRAMBUS.*

CRAMBUS PRATELLUS.

CRAMBUS DUMETELLUS.

Wallasey sand hills.

CRAMBUS PASCUELLUS.

Bidston Marsh. Claughton fir wood. Burton.

CRAMBUS HORTUELLUS.

CRAMBUS CULMELLUS.

CRAMBUS GENICULEUS.

Wallasey sand hills.

CRAMBUS CONTAMINELLUS.

Rather scarce. Puddington.

CRAMBUS TRISTELLUS.

CRAMBUS SELASELLUS.

Puddington.

CRAMBUS LATISTRUUS.

Formerly not uncommon on a bank, which has since been destroyed, Claughton fir wood. Has been occasionally taken between there and Flaybrick Hill.

CRAMBUS PERLELLUS.

Marshes of Bidston, Bromborough, and Puddington.

Genus CHILO.

CHILO FORFICELLUS.

Scarce. Bidston Marsh. Burton.

CHILO PHRAGMITELLUS.

Scarce. Bidston Marsh.—*Mr. Almond.*

*Family CHLOEPHORIDÆ.**Genus CHLOEPHORA.*

CHLOEPHORA PRASINANA.

Occasionally taken. Rock Ferry. Eastham Wood. Puddington.

*Group TORTRICINA.**Family TORTRICIDÆ.**Genus AMPHISA.*

AMPHISA GERNINGIANA.

Heaths of Bidston Hill, Oxton and Claughton.

*Genus HYPERMECIA.***HYPERMECTIA AUGUSTANA.**

Beaten occasionally from hedges.

*Genus EULIA.***EULIA MINISTRANA.***Genus BRACHYTÆNIA.*

BRACHYTÆNIA SEMIFASCIANA. I am not certain which of these two species
BRACHYTÆNIA HARTMANNIANA. } it was that the late Mr. Langcake took on
 the Wallasey sand hills.

*Genus ANTITHESIA.***ANTITHESIA CORTICANA.**

Bidston Park Wood. Rock Ferry.

ANTITHESIA BETULETANA.

Bidston Park Wood. Rock Ferry.

ANTITHESIA PRELONGANA.

I took a single specimen in Bidston Park Wood.

ANTITHESIA OCHROLEUCANA.**ANTITHESIA CYNOSBATELLA.****ANTITHESIA PRUNIANA.***Genus PENTHINA.***PENTHINA SALICELLA.**

Occurs in Patrick Wood about half-way between Bromborough Mills and
 the Birkenhead and Chester Railway.

*Genus CLEPSIS.***CLEPSIS RUSTICANA.**

I took a single specimen on Bidston Marsh.

*Genus TORTRIX.***TORTRIX ICTERANA.**

On banks. Abundant near New Ferry.

TORTRIX VIRIDANA.**TORTRIX FORSTERANA.****TORTRIX HEPARANA.****TORTRIA RIBEANA.****TORTRIX CORYLANA.**

Most frequent in woods.

*Family PLICATÆ.**Genus LOZOTÆNIA.***LOZOTÆNIA MUSCULANA.**

In hedges.

LOZOTÆNIA COSTANA.

Formerly common on Bidston Marsh. Burton Marsh.

LOZOTÆNIA UNIFASCIANA.**LOZOTÆNIA FULVANA.****LOZOTÆNIA ROSANA.****LOZOTÆNIA XYLOSTEANA.**

Less frequent than the last, and not so generally distributed.

*Genus DITULA.***DITULA ANGUSTIORANA.**

Occasionally met with.

*Genus PTYCHOLOMA.***PTYCHOLOMA LECHEANA.**

Puddington.

*Genus NOTOCELIA.***NOTOCELIA UDMANNIANA.***Genus PARDIA.***PARDIA TRIPUNCTANA.***Genus SPILONOTA.***SPILONOTA ROBORANA.****SPILONOTA ROSECOLANA.**

Seems scarce. Puddington.

SPILONOTA TRIMACULANA.**SPILONOTA AMGENANA.**

Wallasey sand hills.

*Genus LITHOGRAPHIA.***LITHOGRAPHIA CAMPOLILIANA.****LITHOGRAPHIA NISELLA.**

Seems scarce. Puddington.

*Genus PHLÆODES.***PHLÆODES TETRAQUETRANA.**

Occasionally met with.

PHLÆODES IMMUNDANA.

Occasionally taken.

*Genus PÆDISCA.***PÆDISCA PICEANA.**

Not abundant. Wallasey sand hills.

PÆDISCA SOLANDRIANA.**PÆDISCA OPTHALMICANA.**

Not common. Tranmere.

*Genus CATOPTRIA.***CATOPTRIA HOHENWARTHIANA.****CATOPTRIA SCOPOLIANA.**

Three injured specimens. Puddington.

CATOPTRIA CÆCIMACULANA.

I have taken one specimen. Tranmere.

*Genus HALONOTA.***HALONOTA TRIGEMINANA.**

Occasionally taken. Tranmere.

HALONOTA SCUTULANA.

Formerly in Gill Brook, North Birkenhead.

HALONOTA BRUNNICHIANA.**HALONOTA TETRAGONANA.***Genus DICRORAMPHA.***DICRORAMPHA PETIVERELLA.**

Occasionally taken. Tranmere.

DICRORAMPHA TANACETI.*Genus COCCYX.***COCCYX HYRCINIANA.**

Seems scarce. Bidston Park Wood. Puddington.

*Genus CARTELLA.***CARTELLA BILUNANA.**

Bidston Park Wood.

*Family ANCHYLOPERIDÆ.**Genus HEDYA.***HEDYA PAYKULLIANA.**

Bidston Park Wood.

HEDYA OCCELLANA.

Not uncommon. Was formerly very abundant in a hedge which is now destroyed, Bidston Marsh.

HEDYA DEALBANA.

Scarce. Puddington.

HEDYA NEGLECTANA.

HEDYA TRIMACULANA.

Perhaps most abundant in Claughton Park, Birkenhead.

Genus STEGANOPTYCHA.

STEGANOPTYCHA NÆVANA.

Occasionally taken.

Genus ANCHYLOPERA.

ANCHYLOPERA MITTERBACHERIANA.

ANCHYLOPERA BIARCUANA.

Formerly not uncommon in Claughton Fir Wood. Taken occasionally elsewhere.

ANCHYLOPERA LUNDANA.

ANCHYLOPERA UNGICELLA.

Bidston Hill.

Genus BACTRA.

BACTRA LANCEOLANA.

BACTRA FURFURANA.

Seems scarce. Bidston Marsh.

Genus ARGYROTOZA.

ARGYROTOZA CONWAYANA.

Not uncommon. Rock Ferry.

Genus DICTYOPTERYX.

DICTYOPTERYX CONTAMINANA.

DICTYOPTERYX LŒFLINGIANA.

Amongst oaks.

Genus CRŒSIA.

CRŒSIA BERGMANNIANA.

CRŒSIA FORSKALEANA.

Wallasey. North Birkenhead.

CRŒSIA HOLMIANA.

Tranmere.

Genus HEMEROSIA.

HEMEROSIA RHEEDIELLA.

Occasionally taken. Prenton Lane.

Family PERONEIDÆ.

Genus CHEIMATOPHILA.

CHEIMATOPHILA MIXTANA.

Abundant on Bidston Hill. Claughton Fir Wood.

*Genus OXYGRAPHA.***OXYGRAPHA LITERANA.**

Occasionally taken. Bidston. Prenton Wood. Eastham Wood.

*Genus PERONEA.***PERONEA COMPARANA.****PERONEA SCHALLERIANA.****PERONEA POTENTILLANA.**

North Birkenhead.—*Mr. Almond.* New Brighton.—*Mr. N. Cook.*

PERONEA TRISTANA.

Rock Ferry.

PERONEA FAVILLACEANA.**PERONEA HASTIANA.****PERONEA PERMUTANA.**

Wallasey Sand Hills.

PERONEA VARIEGANA.*Genus PARAMESIA.***PARAMESIA ASPERSANA.**

Wallasey.

PARAMESIA FERRUGANA.

I have taken two specimens near Tranmere. Common in Eastham Wood.

PARAMESIA CALEDONIANA.

Rock Ferry.

*Genus TERAS.***TERAS CAUDANA.***Family STIGMONOTIDÆ.**Genus PŒCILOCHROMA.***PŒCILOCHROMA CORTICANA.**

Most frequent in woods.

*Genus EPHIPPIPHORA.***EPHIPPIPHORA REGIANA.**

Taken by Messrs. Almond and Warrington between Poulton and Seacombe.

EPHIPPIPHORA ARGYRANA.

Occasionally taken. Bidston Park Wood.

*Genus ASTHENIA.***ASTHENIA CONIFERANA.**

Fir woods of Bidston and Prenton Mount. Also Burton.

*Genus RETINIA.***RETINIA BUOLIANA.**

Fir wood on Bidston Hill, near the Upton road.

RETINIA PINICOLANA.

In the fir woods of Bidston and Claughton.

RETINIA PINIVORANA.

Fir woods of Bidston and Claughton. Also Burton.

RETINIA OCCULTANA.

Not abundant. Claughton Fir Wood.

*Family CARPOCAPSIDÆ.**Genus ENDOPISA.***ENDOPISA GERMARANA.**

Not uncommon. Tranmere.

*Genus CARPOCAPSA.***CARPOCAPSA SPLENDANA.**

Eastham Wood.

*Genus GRAPHOLITA.***GRAPHOLITA ULICETANA.****GRALHOLITA HYPERICANA.**

Has been taken by Mr. Almond near Seacombe.

*Family CNEPHASIDÆ.**Genus SPALEROPTERA.***SPALEROPTERA ICTERICANA.**

Wallasey sand hills. Bidston Marsh.

*Genus CNEPHASIA.***CNEPHASIA HYBRIDANA.**

Tranmere. Burton.

CNEPHASIA SUBJECTANA.**CNEPHASIA VIRGAUREANA.****CNEPHASIA OCTOMACULANA.**

Formerly occurred in a fence on Bidston Marsh which has been destroyed.
Claughton. Puddington.

*Genus ABLABIA.***ABLABIA PRATANA.**

Bidston Marsh. Ledsam.

*Family SERICORIDÆ.**Genus EUCHROMIA.***EUCHROMIA STRIANA.**

Bidston Marsh. Claughton.

*Genus ORTHOTÆNIA.***ORTHOTÆNIA ANTIQUANA.**

Not common. Taken by the late Mr. Langeake on the Wallasey sand hills.

Bidston Marsh. Burton Marsh.

*Genus SERICORIS.***SERICORIS LACUNANA.****SERICORIS URTICANA.****SERICORIS CESPITANA.**

Wallasey sand hills.

SERICORIS POLITANA.

Is taken occasionally.

SERICORIS LITTORALIS.

Puddington Marsh.

*Family LOZOPERIDÆ.**Genus ERIOPSELA.***ERIOPSELA FRACTIFASCIANA.**

Has been taken near Tranmere.

*Genus CALOSETIA.***CALOSETIA NIGROMACULANA.**

Wallasey. Bidston Marsh. Burton.

*Genus EUPŒCILIA.***EUPŒCILIA ATRICAPITANA.**

Occasionally taken all round Birkenhead.

EUPŒCILIA ANGUSTANA.

Claughton Fir Wood.

EUPŒCILIA GRISEANA.Formerly common near Seacombe, on ground now occupied by the docks,
&c. Bidston Marsh.**EUPŒCILIA RUPICOLA.**

Seems scarce. Wallasey. Bidston Marsh. Puddington.

EUPŒCILIA ROSEANA.

I have bred it from Teazle found on Bidston Marsh.

EUPŒCILIA ALBICAPITANA.

Has been taken by a friend on the sand hills near New Brighton.

EUPŒCILIA RUFICILIANA.

Was formerly abundant on the ground now occupied by the entrances to the Great Float, Birkenhead. Scarce at Puddington.

Genus LOZOPERA.

LOZOPERA STRAMINEA.

Genus XANTHOSETIA.

XANTHOSETIA HAMANA.

XANTHOSETIA ZEGANA.

*Family TORTRICODIDÆ.**Genus TORTRICODES.*

TORTRICODES HYEMANA.

*Group TINEINA.**Family EXAPATIDÆ.**Genus CHIMABACCHE.*

CHIMABACCHE PHRYGANELLA.

Eastham Wood.

CHIMABACCHE FAGELLA.

Genus SEMIOSCOPIS.

SEMIOSCOPIS STEINKELLNERIANA.

Wallasey. Bidston. Prenton and Ledsham.

*Family TINEIDÆ.**Genus TALÆPORIA.*

TALÆPORIA PSEUDO-BOMBYCELLA.

On the heath on Bidston Hill. Also on trunks of trees in woods.

Genus SOLENOBIA.

SOLENOBIA INCONSPICUELLA.

Bred by Mr. Almond from cases found in Claughton Fir Wood. Cases of perhaps another species occur on trunks of trees in Bidston Park Wood, and at Puddington. Cases also occur on stones near Wallasey. As nothing but wingless females have as yet been bred from these two sets of cases, I do not know whether they are *S. Inconspicella* or other species of *Solenobia*.

Genus DIPLODOMA.

DIPLODOMA MARGINIPUNCTELLA.

Rock Ferry.

*Genus XYSMATODOMA.***XYSMATODOMA MELANELLA.**

Eastham Wood.

*Genus OCHSENHEIMERIA.***OCHSENHEIMERIA BIRDELLA.**

Near Seacombe, close to the Great Float.

*Genus TINEA.***TINEA RUSTICELLA.****TINEA TAPETZELLA.**

Where woollen goods are stored.

TINEA ARCELLA.

Seems scarce. Puddington.

TINEA CORTICELLA.

Puddington.

TINEA PARASITELLA.

Seems scarce. Bidston Park Wood.

TINEA GRANELLA.

Warehouses where corn is stored, Birkenhead.

TINEA CLOACELLA.**TINEA ALBIPUNCTELLA.**

Seems scarce. Bidston.

TINEA MISSELLA.

In outhouses.

TINEA FUSCIPUNCTELLA.

In houses.

TINEA PALLESCENTELLA.

I took specimens in Birkenhead which I knew were imported amongst furs from Honduras. The species is probably naturalized in Birkenhead.

TINEA LAPELLA.

Occasionally taken in woods.

TINEA BISELLIELLA.

In houses.

TINEA SEMIFULVELLA.

Occasionally taken.

TINEA BISTRIGELLA.

Seems scarce. Bidston.

*Genus LAMPRONIA.***LAMPRONIA QUADRIPUNCTELLA.**

Not uncommon. Tranmere.

*Genus INCURVARIA.***INCURVARIA MASCALELLA.***Genus NEMOPHORA.***NEMOPHORA SCHWARZIELLA.***Genus ADELA.***ADELA VIRIDELLA.**

In oak woods.

*Family MICROPTERYGIDÆ.**Genus MICROPTERYX.***MICROPTERYX SEPPELLA.**

Bidston. Tranmere.

MICROPTERYX SUBPURPURELLA.

Prenton Mount Wood. Eastham Wood. Puddington.

*Family HYPONOMEUTIDÆ.**Genus SWAMMERDAMIA.***SWAMMERDAMIA APICELLA.****SWAMMERDAMIA GRISEOCAPITELLA.**

Occasionally taken. Bidston. Puddington.

SWAMMERDAMIA LUTAREA.

Sometimes met with. Tranmere.

SWAMMERDAMIA PYRELLA.*Genus HYPONOMEUTA.***HYPONOMEUTA PADELLUS.****HYPONOMEUTA EUONYMELLUS.**

Cloughton Park. Birkenhead.

*Genus PRAYS.***PRAYS CURTISELLUS.***Family PLUTELLIDÆ.**Genus PLUTELLA.***PLUTELLA CRUCIFERARUM.****PLUTELLA PORRECTELLA.**

Seems scarce. Rock Ferry.

PLUTELLA DAELLA.

Seems scarce. Bidston Hill. Cloughton Fir Wood.

*Genus CEROSTOMA.***CEROSTOMA VITTELLA.**

Puddington.

CEROSTOMA RADIATELLA.**CEROSTOMA COSTELLA.**

Patrick Wood, near Bromborough Mills.

CEROSTOMA XYLOSTELLA.*Family GELECHIDÆ.**Genus ORTHOTÆLIA.***ORTHOTELIA SPARGANELLA.**

Bidston Marsh.

*Genus PHIBALOCERA.***PHIBALOCERA QUERCANA.***Genus EXÆRETIA.***EXÆRETIA ALLISELLA.**

I once or twice met with this species rather freely in the fence separating the sand hills from the fields near Wallasey.

*Genus DEPRESSARIA.***DEPRESSARIA COSTOSA.**

Wallasey. Bidston. Oxton. Puddington.

DEPRESSARIA LITURELLA.**DEPRESSARIA UMBELLANA.****DEPRESSARIA ASSIMILELLA.**

Amongst broom. Wallasey. Claughton. Tranmere.

DEPRESSARIA ARENELLA.**DEPRESSARIA PROPINQUELLA.**

Wallasey. Bidston.

DEPRESSARIA SUBPROPINQUELLA.

Less frequent than the last. Bidston.

DEPRESSARIA ALSTRÆMERIANA.

Not uncommon. Wallasey. Leasowe. Bidston. Puddington.

DEPRESSARIA PURPUREA.

Occasionally met with. Wallasey. Bidston. Eastham. Puddington.

DEPRESSARIA CONTERMINELLA.

Not uncommon. Wallasey. Bidston.

DEPRESSARIA ANGELICELLA.Formerly abundant in a small plantation which has been destroyed.
Bidston Marsh.

DEPRESSARIA OCELLANA.

DEPRESSARIA YEATIANA.

Wallasey. Bidston. Oxton.

DEPRESSARIA APPLANA.

DEPRESSARIA CILIELLA.

Bidston Hill. Prenton Mount Wood.

DEPRESSARIA PIMPINELLÆ.

Wallasey, and on the sand hills.

DEPRESSARIA PULCHERRIMELLA.

Leasowe. Bidston.

DEPRESSARIA NERVOSA.

DEPRESSARIA BADIELLA.

I took a single specimen some years ago on the Wallasey sand hills.

DEPRESSARIA HERACLEANA.

Bidston. Tranmere.

Genus GELECHIA.

GELECHIA CINERELLA.

Wallasey sand hills.

GELECHIA RUFESCENS.

GELECHIA POPULELLA.

Wallasey sand hills.

GELECHIA TEMERELLA.

Wallasey sand hills.

GELECHIA LENTIGINOSELLA.

North Birkenhead.

GELECHIA VELOCELLA.

Wallasey sand hills

GELECHIA FUMATELLA.

Seems scarce. Wallasey sand hills.

GELECHIA ERICETELLA.

Probably wherever heath grows.

GELECHIA MULINELLA.

Wallasey. Tranmere.

GELECHIA SORORCULELLA.

Wallasey sand hills.

GELECHIA LONGICORNIS.

Prenton Mount Wood.

GELECHIA DIFFINIS.

Wallasey. Bidston Marsh.

GETECHIA TERRELLA.

GELECHIA DESERTELLA.

Wallasey sand hills.

GELECHIA POLITELLA.

Wallasey sand hills.

GELECHIA ARTEMISIELLA.

Wallasey sand hills.

GELECHIA SENECTELLA.

Wallasey sand hills.

GELECHIA MUNDELLA.

Wallasey sand hills.

GELECHIA AFFINIS.

Wallasey sand hills.

GELECHIA DOMESTICA.

GELECHIA PROXIMELLA.

Seems scarce. Bidston Park Wood.

GELECHIA NOTATELLA.

Occasionally beaten from hedges.

GELECHIA VULGELLA.

GELECHIA ÆTHIOPS.

Prenton Mount Wood.

GELECHIA DISTINCTELLA.

Wallasey sand hills.

GELECHIA MACULEA.

I took a single specimen some years ago, most probably in Claughton.

GELECHIA TRICOLORELLA.

Bred by Mr. Almond from larvæ found near Eastham Wood.

GELECHIA MACULIFERELLA.

Wallasey sand hills.

GELECHIA MARMOREA.

Wallasey sand hills.

GELECHIA LITTORELLA.

Wallasey sand hills.

GELECHIA MOUFFETELLA.

Tranmere.

GELECHIA DODECELLA.

Fir woods of Bidston and Claughton.

GELECHIA TENEBRELLA.

Oxton.

GELECHIA TÆNIOLELLA.

Wallasey sand hills.

GELECHIA ANTHYLLIDELLA

Wallasey sand hills.

GELECHIA GEMMELLA.

Bidston. Rock Ferry.

GELECHIA HERMANELLA.

Wallasey. Oxton. Tranmere.

GELECHIA ERICINELLA.

Heath, near Oxton.

Genus PARASIA.

PARASIA LAPPPELLA.

Abundant between Flaybrick Hill and Claughton Park, Birkenhead.

Genus CHELARIA.

CHELARIA HUBNERELLA.

Bidston.

Genus ANARSIA.

ANARSIA SPARTIELLA.

Wallasey. Bidston.

Genus PLEUROTA.

PLEUROTA BICOSTELLA.

Heaths of Bidston Hill, Oxton, Clanghton and Prenton Mount. Also Burton.

Genus HARPELLA.

HARPELLA GEOFFRELLA.

Puddington.

*Family ECOPHORIDÆ.**Genus DASYCERA.*

DASYCERA SULPHURELLA.

Genus ECOPHORA.

ECOPHORA MINUTELLA.

Seems scarce. Puddington.

ECOPHORA SUBAQUILEA.

Bidston Hill.

ECOPHORA FLAVIFRONTELLA.

Seems scarce. Bidston Park Wood.

ECOPHORA FUSCESCENS.

Bidston Hill. Puddington.

ŒCOPHORA PSEUDO-SPRETELLA.

Birkenhead.

Genus ENDROSIS.

ENDROSIS FENESTRELLA.

Genus BUTALIS.

BUTALIS GRANDIPENNIS.

Bidston Hill. Oxton Heath.

*Family GLYPHIPTERYGIDÆ.**Genus ACROLEPIA.*

ACROLEPIA GRANITELLA.

I took a single specimen I think either near Bidston or Claughton.

Genus GLYPHIPTERYX.

GLYPHIPTERYX FUSCOVIRIDELLA.

Trannere. Prenton Lane

GLYPHIPTERYX THRASONELLA.

Bidston Marsh. Prenton Wood.

GLYPHIPTERYX FISCHERIELLA.

Bidston. Trannere.

Genus PERITTIA.

PERITTIA OBSCUREPUNCTELLA.

Patrick Wood, near Bromborough Mills. Puddington.

Genus TINAGMA.

TINAGMA SERICIELLUM.

Trannere.

*Family ARGYRESTHIDÆ.**Genus ARGYRESTHIA.*

ARGYRESTHIA EPHIPPELLA.

I took a single specimen some years ago. Locality forgotten.

ARGYRESTHIA NITIDELLA.

In hedges.

ARGYRESTHIA SEMITESTACELLA.

In hedges.

ARGYRESTHIA ALBISTRIA.

In hedges.

ARGYRESTHIA CONJUGELLA.

Bidston Park Wood. ♀

ARGYRESTHIA SEMIFUSCA.

Bidston Park Wood.

ARGYRESTHIA MENDICA.

In hedges.

ARGYRESTHIA GLAUCINELLA.

Patrick Wood, near Bromborough Mills.

ARGYRESTHIA RETINELLA.

In hedges.

ARGYRESTHIA PYGMÆELLA.

Near Flaybrick Hill. Tranmere.

ARGYRESTHIA GOEDARTELLA.

Bidston Park Wood. Claughton. Rock Ferry.

ARGYRESTHIA BROCKEELLA.

Bidston Park Wood. Rock Ferry.

*Genus CEDESTIS.***CEDESTIS FARINATELLA.**

Fir woods of Bidston and Claughton. Also Burton.

*Genus OCNEROSTOMA.***OCNEROSTOMA PINIARIELLA.**

Fir woods of Bidston and Claughton.

*Family GRACILARIIDÆ.**Genus GRACILARIA.***GRACILARIA SWEDERELLA.****GRACILARIA STIGMATELLA.**

Wallasey. Bidston. Puddington.

GRACILARIA FLONGELLA.

Bidston. Claughton. Puddington.

GRACILARIA TRINGIPENNELLA.

Locality near Birkenhead forgotten. Puddington.

GRACILARIA SYRINGELLA.**GRACILARIA PHASIANIPENNELLA (VAR. QUADRUPLELLA.)**

In a single instance. Locality forgotten. Bidston? or Claughton?

*Genus ORNIX.***ORNIX ANGLICELLA.****ORNIX TORQUILLELLA.**

Tranmere.

ORNIX SCOTICELLA.

One specimen taken. Bidston Park Wood.

ORNIX GUTTEA.

Upton. Tranmere.

*Family COLEOPHORIDÆ.**Genus COLEOPHORA.***COLEOPHORA JUNCICOLELLA.**

Bidston Hill. Puddington.

COLEOPHORA LARICELLA.

Bidston Park Wood.

COLEOPHORA LUTIPENNELLA.

Tranmere.

COLEOPHORA FUSCEDINELLA.

Puddington.

COLEOPHORA VIMINETELLA.

Wallasey. North Birkenhead.

COLEOPHORA GRYPHIPENNELLA.**COLEOPHORA NIGRICELLA.**

Tranmere. Rock Ferry.

COLEOPHORA ALCYONIPENNELLA.

Everywhere round Birkenhead.

COLEOPHORA FABRICIELLA.

In a single instance between Flaybrick Hill and Claughton Park, Birkenhead. Has been taken also by Mr. Almond in the same neighbourhood.

COLEOPHORA ANATIPENNELLA.

Wallasey sand hills. Bidston.

COLEOPHORA ALBICOSTA.**COLEOPHORA PYRRHULIPENNELLA.**

Bidston Hill.

COLEOPHORA DISCORDELLA.

Wallasey sand hills. Near New Ferry.

COLEOPHORA THERINELLA?

Or new species? A single specimen taken. Wallasey sand hills.

COLEOPHORA ANNULATELLA.

Wallasey. North Birkenhead. Seacombe.

COLEOPHORA CÆSPLITIELLA.

Bidston. North Birkenhead.

*Family ELACHISTIDÆ.**Genus BATRACHEDRA.***BATRACHEDRA PRÆANGUSTA.**

Bidston Park Wood. Ledsham.

*Genus CHAULIODUS.***CHAULIODUS CHÆROPHYLLELLUS.**

Mr. Diggles took specimens near West Kirby.

*Genus LAVERNA.***LAVERNA OCHRACEELLA.**

Bidston Marsh. Puddington.

LAVERNA ATRA.

Tranmere.

*Genus CHRYSOCLISTA.***CHRYSOCLISTA FLAVICAPUT.**

In hedges.

*Genus CHRYSOCORYS.***CHRYSOCORYS FESTALIELLA.**

Bidston. Prenton. Eastham Wood.

*Genus ELACHISTA.***ELACHISTA ALBIFRONTELLA.****ELACHISTA LUTICOMELLA.**

Rock Ferry. Bromborough.

ELACHISTA NIGRELLA.

Rock Ferry.

ELACHISTA OBSCURELLA.**ELACHISTA HUMILIS.**

Rock Ferry.

ELACHISTA MEGERLELLA.

Rock Ferry.

ELACHISTA CERUSSELLA.

Bidston Marsh. Puddington.

ELACHISTA RHYNCHOSPORELLA.

Formerly abundant in a boggy part of Claughton Fir Wood. Houses now occupy the ground.

ELACHISTA RUFOCINEREA.**ELACHISTA CYGNIPENNELLA.****ELACHISTA OCHREELLA.**

I have taken one or two specimens. Locality forgotten. Bidston Marsh.

*Genus TISCHERIA.***TISCHERIA COMPLANELLA.**

Eastham Wood.

TISCHERIA MARGINEA.

*Family LITHOCOLLETIDÆ.**Genus LITHOCOLLETIS.***LITHOCOLLETIS CRAMERELLA.**

Rock Ferry.

LITHOCOLLETIS ALNIFOLIELLA.

Locality forgotten.

LITHOCOLLETIS ULMIFOLIELLA.

Locality forgotten.

LITHOCOLLETIS POMIFOLIELLA.

Locality forgotten.

LITHOCOLLETIS FAGINELLA.

Bidston.

LITHOCOLLETIS CORYLI**LITHOCOLLETIS QUINQUEGUTTELLA.**

Wallasey sand hills.

LITHOCOLLETIS QUERCIFOLIELLA.**LITHOCOLLETIS MESSANIELLA.****LITHOCOLLETIS ULICICOLELLA.**

Wallasey. Prenton.

LITHOCOLLETIS CORYLIFOLIELLA.

Tranmere.

LITHOCOLLETIS FROLICHIELLA.

Bidson. Tranmere.

LITHOCOLLETIS KLEMANELLA.

Clifton Park, near Birkenhead.

LITHOCOLLETIS TRISTRIGELLA.

Bidston Park Wood.

LITHOCOLLETIS TRIFASCIELLA.*Family LYONETIDÆ.**Genus CEMIOSTOMA.***CEMIOSTOMA SPARTIFOLIELLA.**

Tranmere.

CEMIOSTOMA SCITELLA.

Tranmere.

*Genus BUCCULATRIX.***BUCCULATRIX AURIMACULELLA.**

Bidston Pleasure-grounds.

*Family NEPTICULIDÆ.**Genus NEPTICULA.*

NEPTICULA OXYACANTHELLA.

Tranmere.

NEPTICULA SUBBIMACULELLA

NEPTICULA SALICIS.

NEPTICULA FOSLACTELLA.

Tranmere.

*Group PTEROPHORINA.**Genus PTEROPHORUS.*

PTEROPHORUS OCHRODACTYLUS.

Wallasey. Tranmere. Puddington.

PTEROPHORUS TRIGONODACTYLUS.

PTEROPHORUS PUNCTIDACTYLUS.

Bidston. Tranmere.

PTEROPHORUS HIERACII.

Bidston.

PTEROPHORUS BIPUNCTIDACTYLUS.

Wallasey sand hills.

PTEROPHORUS FUSCUS.

Wallasey sand hills.

PTEROPHORUS PTERODACTYLUS.

PTEROPHORUS PENTADACTYLUS.

Wallasey. Tranmere.

*Group ALUCITINA.**Genus ALUCITA.*

ALUCITA POLYDACTYLA.

ADDENDUM.

EUCHROMIA ERICETANA.

Ledsham.

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